MODERN PLASTICS

MAY 1951

It pays to use your custom molder's know-how

and proof is clear on a million TV screens

No. 26 in a Series on Plastics Skill at Work...

PROJECT: Deflecting yoke spool for TV picture tubes
CUSTOMER: RCA Victor Division, Radio Corporation of America
MOLDER: Shaw Insulator Co.
MATERIAL: Durez black general-purpose phenolic plastic

ONE RIM OF SPOOL serves as terminal board for 8 terminals, and supports small resistors and capacitors. Molded-in interlocking projections facilitate assembly of the 2-piece spools. The use of molded half-spools made it possible to replace approximately eight parts formerly used.

EIGHT HALF-SPOOLS of Durez phenolic per "shot" are produced by custom molder. These meet rigid requirements including very thin walls, dimensional exactness, freedom from warping, high insulating value, and resistance to heat.

● "Riding" the neck of the modern cathode-ray TV picture tube is a deflecting yoke . . . deflecting coils and magnetic core . . . which guides the electron stream that is transformed into glowing video pictures on the screen face of the tube.

The yoke is the extremely critical component that determines the uniform brightness of the picture, its symmetry, and freedom from exaggeration and distortion. Its elements must be supported in an exact relationship, and insulated to withstand high voltage.

This is the job of the spool molded of Durez phenolic plastic . . . another example of the custom molder's know-how in meeting severe requirements with parts that simplify assembly. Supplanting a stapled cardboard assembly, the molded Durez spools have contributed to the dramatic growth of the television industry by making possible a distinct improvement in a vital component in more than a million sets.

Your custom molder's know-how, plus the famous versatility of Durez phenolics, is a hard-to-beat team when you want the best value you can get for your plastics dollar.

Ready with skilled counsel is your Durez technician, backed by over 25 years of specialized experience.

Our monthly "Durez Plastics News" will keep you abreast of industry's uses of Durez. Write, on office letterhead, to Durez Plastics & Chemicals, Inc., 1205 Walck Road, North Tonawanda, N. Y.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB

A Professionally Approved Eye-Training Service ...Molded of Eye-Appealing

Catalin **STYRENE**

More than 150,000 KEYSTONE STEREOSCOPES* have thus far been prescribed by eye specialists, for orthoptic home training. Patients, subject to instructions, follow specific courses of three-dimensional stereograph viewing which, in exercising the eyes, provide a most effective technique for correcting certain types of visual difficulties.

Precision-processed of rich, colorful CATALIN STYRENE, the assembly is desirably light, well balanced, structurally strong. Edges and surfaces are smooth, flawlessly rounded. This application, too, appropriately evidences the fact that products made of CATALIN STYRENE are "easy on the eyes"!

CATALIN CORPORATION OF AMERICA • ONE PARK AVENUE, NEW YORK 16, N. Y.

**Custom molded by Michigan Molded Plastics, Inc., Dexter, Mich. for Keystone View Company, Meadville, Pa.*

MODERN PLASTICS*

VOLUME 28 MAY 1951 NUMBER 9

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Modern Plastics, published monthly by Modern Plastics, Inc. at Emmett St., Bristol, Conn. Executive and Editorial Office: 575 Madison Ave., New York 22, N. Y. Published each month by Modern Plastics, Inc. Entered as second class matter at the Post Office at Bristol, Conn., December 14, 1950, under the act of March 3, 1879.

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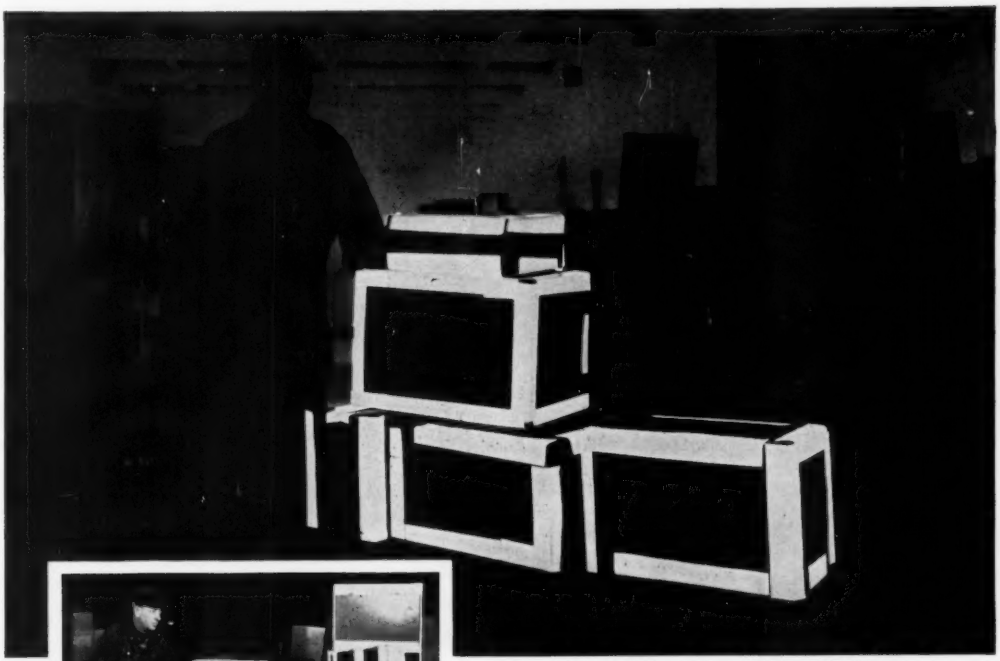
Subscription $5.00 a year, $8.00 for two years in the U. S., its possessions, and South America. Canadian subscription $5.00 a year, $8.00 for two years. All other countries $5.00 a year, $8.00 for two years, payable in U. S. currency. Price of this issue 75 cents per copy. Printed in the U.S.A. by the Hildreth Press, Inc., Bristol, Connecticut.

* Reg. U.S. Pat. Office.

Another new development using

B. F. Goodrich Chemical Company *raw materials*



B. F. Goodrich Chemical Company does not make this tape. We supply raw materials for the coating only.

Tape that says "HERE I AM" in the dark!

THIS luminescent tape glows brightly all night long . . . an important safety factor wherever artificial lighting is not possible. It renews itself during daylight again and is good for many nights' use. In the luminescent coating a Geon resin serves as the pigment binder. This in turn is protected by a transparent surface coating of Geon.

Because water would damage the luminescence, Geon guards it against dampness and also protects it against scuffing, grease and oil.

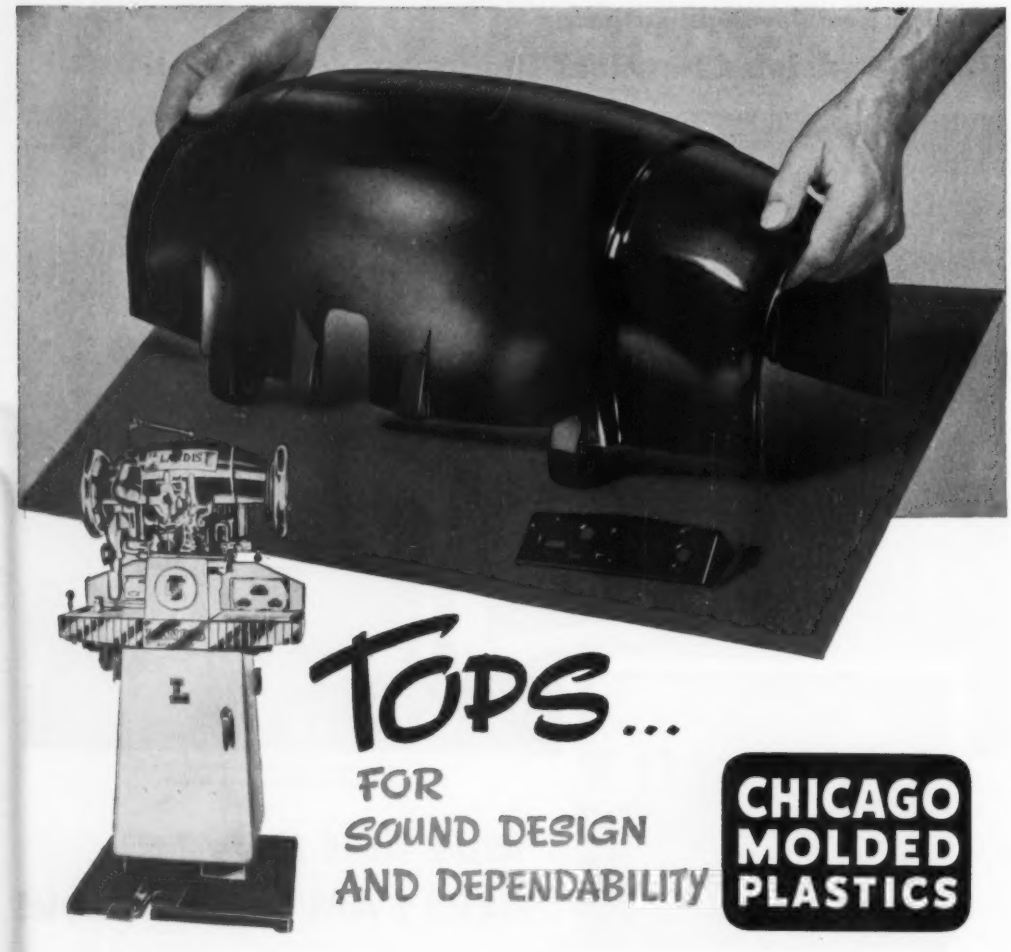
This luminescent tape is at present not available for civilian use.

It's another example of Geon materials' versatility. For Geon is adaptable to scores of uses where resistance to heat and cold, weather, aging and wear are important—often vital. And Geon materials have *more* advantages. They're highly resistant to oil and grease, chemicals and other damaging elements.

Geon materials come in many forms —including resin, latex and compounded plastics. They may be just what you need to improve or develop a product, or to convert to defense production. Right now demand exceeds supply, but experimental quantities are available for development work. For information and helpful technical advice, please write Dept. GA-5, B.F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors



TOPS...

FOR SOUND DESIGN AND DEPENDABILITY

CHICAGO MOLDED PLASTICS

This new top housing for the Landis Shoe Stitcher is a big baby . . . with extra thick walls and rugged hinge members. Not only does it enhance the fine appearance of the unit but in addition, it dampens noise and insures quieter operation. Molded of improved impact phenolic it's much lighter in weight, too, and the finished cost is 70% less than the old cast housing.

The sturdy tool holder is another distinct improvement. Molded of a rubber phenolic material, it provides added convenience and eliminates an entire assembly operation.

Landis Machine Company, like hundreds of other shrewd buyers of plastics, comes to Chicago Molded for one reason . . . absolute dependability. They know that here they get a plus value that's hard to equal. They get the benefit of more than 30 years experience in plastics . . . sound designing and engineering skill . . . a thorough knowledge of materials and their molding behaviour . . . the finest precision molds . . . and the extensive facilities that insure the correct molding method and equipment for fast, economical volume production.

This matter of dependability is vitally important, particularly if you are planning the production of defense equipment or essential civilian goods. It costs no more. In fact, in the long run it is almost certain to cost you less. So . . . why not discuss your plans with a Chicago Molded engineer? Or, if your engineering is completed, send us prints for quotation. In either case there's no obligation. Just write, wire or phone.

CHICAGO MOLDED PRODUCTS CORPORATION
1046 North Kolmar Avenue **Chicago 51, Illinois**

COMPRESSION, INJECTION AND PLUNGER MOLDING OF ALL PLASTIC MATERIALS

EDITORIAL

Reinforced Plastics are VITAL Now

Some explanation, but not apology, is due our readers for the amount of editorial space we have devoted to reinforced plastics in this and the preceding two issues.

Our customary procedure is to balance the editorial material in each issue as far as possible in proportion to the interests of our readers as we analyze the changing patterns of those interests from month to month. When, gradually or suddenly, a particularly powerful interest is evidenced in a single phase of plastics production, we must pay heed.

Within the past three months the interest of every development and procurement branch of the Armed Services in reinforced plastics has come to a point of actionable enthusiasm. Within that time three more companies have announced their entry into the field of polyester resin manufacture, one glass maker has announced a projected doubling of output, two other companies have announced that they will make fibrous glass for reinforced plastics.

At the Chicago conference of the Reinforced Plastics Division of S.P.I. at the end of February about 250 advance registrations were received and about 300 delegates were expected; final registration was over 600 and every session of the conference was packed. Represented in the attendance was every branch of the Armed Forces, a score of old-established compression and injection molders and high pressure laminators, dozens of present or prospective end users of reinforced plastics product components, a number of consultants, a larger number of material suppliers, and the whole body of men whose business has been built on these materials and processes.

The series of three articles on the promise of the glass-reinforced polyesters, concluded in this issue, points up the violence of the present trend: reinforced plastics are due to become big business!

Probably no plastics materials are being given as much attention in military research and development laboratories as are these. Probably no other plastics are in a position where not more than three big projects for the Armed Forces could drain off every pound of available materials. Probably no other section of the Plastics Industry is comprised of such youthful enterprises that even a short period of stalemate in material availability could be disastrous. Certainly no branch of any industry exceeds this group in enthusiasm and desire to be useful.

Yet, almost everything reinforced plastics require is in short supply or is threatened with short supply—styrene monomer, diabasic acids, peroxide and, to some extent, glass reinforcements.

It is to be hoped that a far-seeing national materials production and allocation policy will provide reinforced plastics with what is needed to maintain its economic health and to grow into usefulness not only in the mobilization program, but in the civilian economy as well.

If the small companies, where the know-how is concentrated, are put out of business by material limitations while waiting for defense orders to be placed, the loss to the nation will be great.

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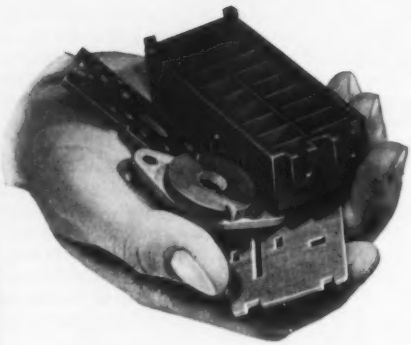
LOOK TO
The RICHARDSON COMPANY
FOR HELP ON PLASTICS
FOR YOUR DEFENSE ORDERS



● If you have a puzzling plastics problem, consult The Richardson Company. The extensive services of its research, design, and engineering departments are offered you without cost or obligation.

Richardson engineers have a broad background in the plastics industry. For many years they have been co-operating with manufacturers in the selection or development of the correct plastics materials, choice of the proper manufacturing process, and actual production of the plastics part. Richardson's molding, laminating, and fabricating experience assure you a thorough handling of your plastics problem from beginning to end.

1 MATERIALS TO MEET GOVERNMENT REQUIREMENTS

The Richardson Company has extensive experience in the volume production of materials made to meet government requirements. In addition, Richardson develops new materials for special applications.

2 FACILITIES FOR MOLDING AND LAMINATING

Richardson is one of the few companies that have the engineering experience and production facilities to do both molding and laminating, and to produce molded laminates and post-formed laminates.

3 SIX PLANT LOCATIONS

The Richardson Company operates large, modern plants at 6 widely separated locations: Melrose Park, Ill.; Indianapolis, Ind.; Newnan, Ga.; New Brunswick, N. J.; Tyler, Tex.; and Ogden, Utah.

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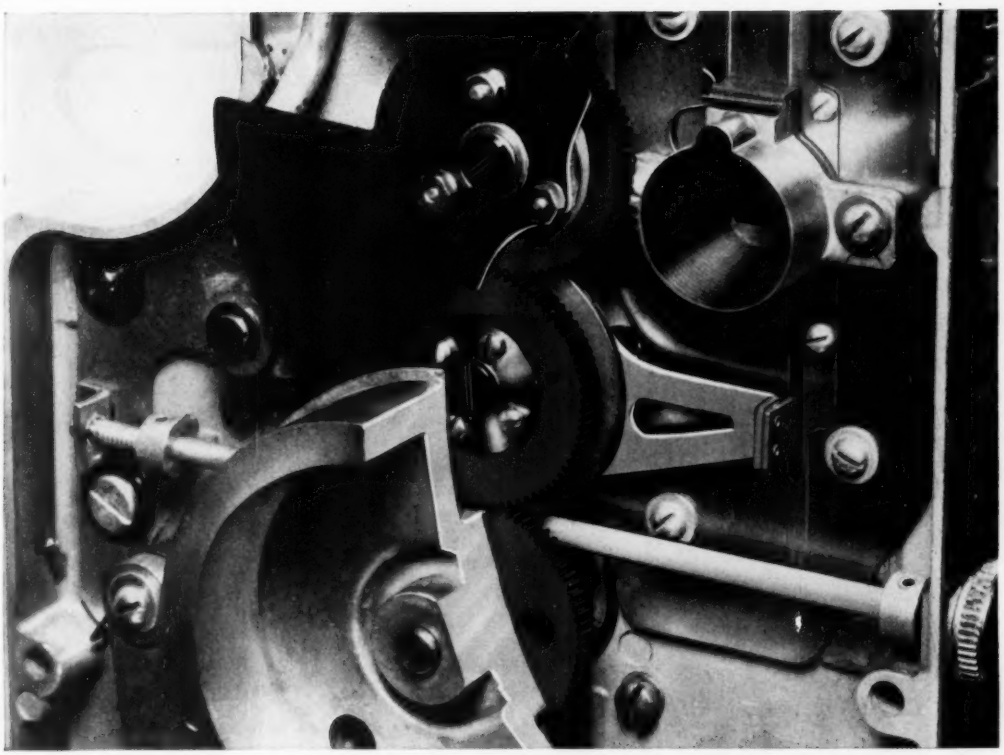
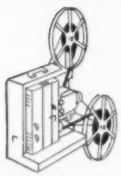
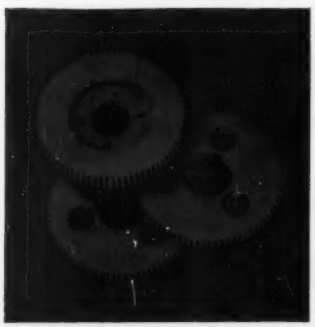




RCA PROJECTOR IS GEARED FOR ECONOMY WITH MOLDED DU PONT NYLON

Nylon plastic gears cost 1/3 to 1/5 as much as former gears . . . give superior performance . . . last over 3 times longer!

". . . an excellent example of the right material in the right spot." That's what RCA says about these nylon gears, used to drive the projector intermittent in their RCA "400" 16-mm. sound film projector.



Lighter in weight, yet more durable than former gears, nylon gears are injection-molded 1¼ inches in diameter with 48-pitch teeth. They are used in the drive revolving at 1440 r.p.m.

To begin with, mass production with injection-molded nylon enables RCA to make these gears at 1/3 to 1/5 the previous cost—a substantial saving. And nylon's resilience permits gear tolerances to be increased. Smooth-running nylon absorbs vibration . . . provides a quieter, more efficient gear drive that *requires no lubrication*. With all these outstanding properties, the nylon gears operate *over three times longer* than former gears!

Nylon plastic may well help you, as it has many other companies, to improve your product or effect savings. Demand for nylon currently exceeds supply. However, we suggest you investigate the versatile properties of nylon for future application, or product improvement.

We will gladly discuss the availability of experimental quantities for development work. Write:

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Polychemicals Dept., Sales Offices:
350 Fifth Avenue, New York 1, N. Y.
7 S. Dearborn St., Chicago 3, Ill.
845 E. 60th St., Los Angeles 1, Calif.

Nylon gears molded by Atlantic Plastics, Inc., Stamford, Conn.

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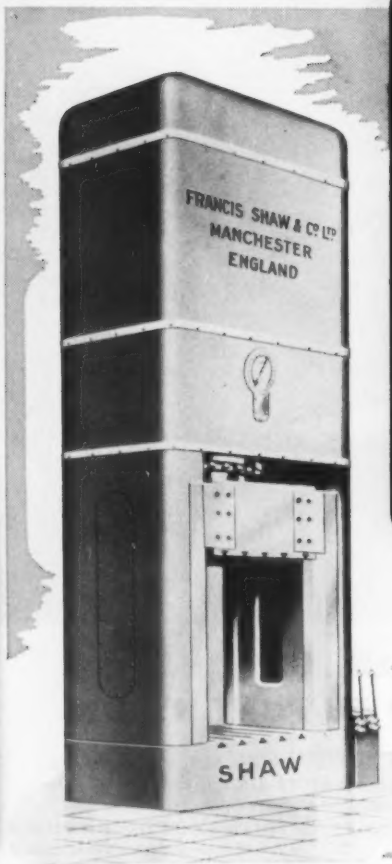

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FOR PLASTICS

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We manufacture for the Plastics Industry all types of hydraulic presses of robust modern design to ensure accuracy of the finished molding. Can be fitted with automatic time-cycle and temperature control.

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R213

Are You Up-to-date on Acetate?

Safety is a job for *Acetate*

Safety equipment illustrated courtesy of Willson Products, Inc., Reading, Pa.

Transparent sheeting made of *acetate* means greater job-safety for thousands of industrial workers. Celanese* acetate supplies the crystal-clear transparency and shatterproof toughness in goggles, shields, respirators, machine guards and other safety equipment.

Willson Products use Celanese acetate sheeting in the manufacture of their Protectoshields, Featherspecs, and Safety Spectacles. They've standardized on acetate for the many plus-features this economical sheeting has to offer—conveniently sized cut sheets and continuous lengths that allow greater flexibility and less waste in production . . . choice of clear or tinted transparencies . . . non-flammability . . . light weight . . . smooth easy-to-clean surface . . . touch comfort.

Is *your* planning up to date on acetate? Celanese Corporation of America, Plastics Division, Dept. 101-E, 180 Madison Avenue, New York 16, N. Y. In Canada, Canadian Cellulose Products, Ltd., Montreal and Toronto.

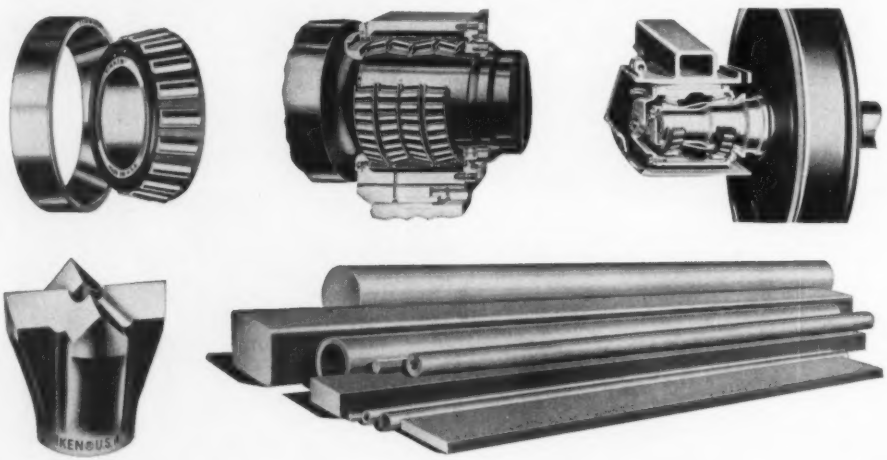
Celanese®

*Reg. U.S. Pat. Off

PLASTICS

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.



Little words that mean a lot

There's no room for compromise, doubt or question in those brief words above. They mean: "Timken" is the registered trade-mark of The Timken Roller Bearing Company. And that meaning is mighty important to you.

The trade-mark "Timken" assures you of getting the highest quality tapered roller bearings, fine alloy steel bars, steel tubing or rock bits—all products of The Timken Roller Bearing Company.

That's why it pays to remember that "Timken" *is* a trade-mark, not a type of product. That it isn't really a product of the Timken Company unless it's backed up with this trade-mark.

Why not make it a habit to look for the trade-mark "Timken" when you buy tapered roller bearings, alloy steel bars, tubing or rock bits. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

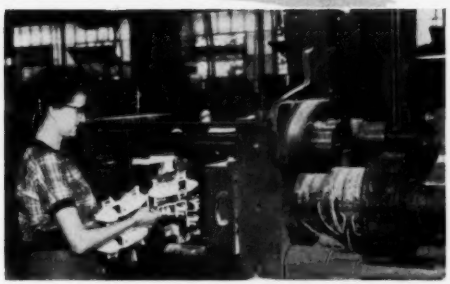
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

ONLY "REEDS" PROVIDE THAT *Extra* CAPACITY!

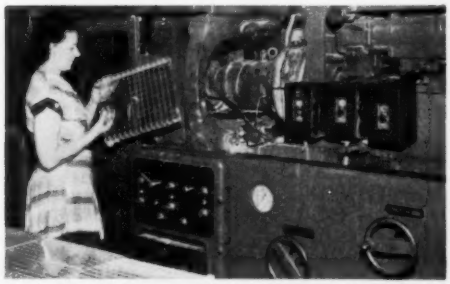


Parts for Nosco Plastic Co.'s "Doodle Bug"— an 11½ oz. shot—being molded on 8 oz. "REED"

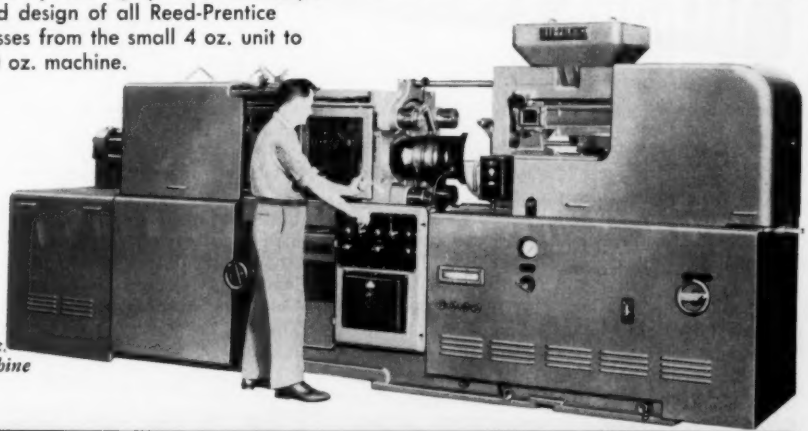
When a molding job taxes the capacity of an ordinary injection press, you can count on a Reed-Prentice machine to provide that extra capacity. Nosco Plastics Co. of Erie, Pa., operating a battery of 20 "Reeds", are fully aware of this ability and are turning out excellent jobs, such as those shown here.

Reed-Prentice injection machines have the accurate timing control, high plasticizing capacity and mold closing pressure to produce these finished products to the most rigid specifications.

The 10D-12 oz. model — with its double shear toggle mechanism, rugged tie bar construction and extra capacity heating cylinder — exemplifies the sound design of all Reed-Prentice injection presses from the small 4 oz. unit to the large 60 oz. machine.



21.4 oz. Refrigerator piece (181 sq. in.) molded on 16 oz. "REED" at Nosco Plastics Co., Erie, Pa.



Reed-Prentice 10D-12 oz. Injection Molding Machine

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NEW BRIGHTNESS in every room through TITANOX PIGMENTED PLASTICS

Useful plastic products in glistening whites and gay tints sparkle throughout today's modern home. Bathrooms are being glamorized through such plastic products as shower curtains, soap dishes, towel racks, brush handles, drinking cups, wall tile, seats. And TITANOX titanium dioxide pigments go a long way in helping make these attractive plastics possible.

TITANOX pigments are compatible with all types of plastics and because of their inertness will not alter the physical characteristics of your products. Their fine and uniform particle size affords easy mixing and compounding for consistent results.

The rutile types of titanium dioxide pigments are universally acceptable to most types of plastics—TITANOX-RA for outstanding whiteness in stocks of low loadings, TITANOX-RCHT for heavily loaded stocks and tints. However, when exceptional whiteness is imperative, TITANOX-A, the anatase titanium dioxide, is often preferred.

Our Technical Service Department is always available for assistance in the pigmentation of your natural or synthetic polymers. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments, Ltd., Montreal 2; Toronto 1.

5071

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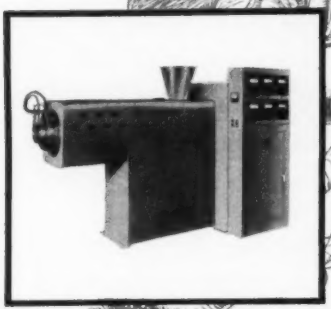
mpm

it's the modern horn of plenty



Here are a few of the products you can make with an MPM extruder . . .

- insulated wire
- rods & tubes for jewelry beads
- wide polyethylene sheet
- inflated tubing to 100″ in circumference
- heavy rods for screw driver handles
- covered flat steel tape for corset stays, etc.
- insulated cable up to 2″ dia.
- monofilaments or thread for weaving into fabric
- coloring of polystyrene, polyethylene, etc.
- uniformly compounded pellets for extrusion or molding
- paper coated with polyethylene
- lead pencil tubing
- knitting needles
- welting for upholstery
- flexible moldings for auto fenders, gaskets, etc.
- profiles and shapes for fluorescent lamp shades
- lay flat tubing for bags used in packaging foods
- collapsible infant feeding bottles

The present day plastics extruding machine is the industrial counterpart of the legendary Horn of Plenty. But while there may be some question concerning the actual existence of the Horn of Plenty, there is nothing fanciful about the ability of an extruder to run out an almost unending wonder of useful products—particularly if the extruder is an MPM.

With a multitude of extruding dies available and many plastic materials to choose from, an MPM extruder is your key to products having literally thousands of uses. And new applications for these extruded products are being developed almost daily.

Because of the high degree of heat control they offer, MPM extruders are favored by those who make frequent shifts in dies and materials. Through use of highest grade materials and design, MPM machines have gained the approval of practically all technicians here and abroad, who have had the opportunity to study or operate our leading line of MODERN extruders.

Whether you want to extrude one product or a variety of products, a thorough examination of all cost and production factors is in order. MPM can help you. An outline of your needs will bring a reply consisting of suggestions on extruding machines, supplementary equipment, layout and the like. Write today.

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
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modern plastic machinery corp.

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

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We reprocess *Your* Plastics Scrap, By-Products, Surplus for *Your* own Re-Use.
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OUR SERVICE

As the world's leading Plastics Scrap Reclaimers we offer the almost unlimited facilities of our vast plant to industry in these days of shortages in all basic raw-materials.

We have available over 150,000 sq. ft. of floor space devoted exclusively to the processing of plastics — virgin and scrap — resinous materials or by-products.

We specialize in the reduction to small particles — to your most exacting specifications — of all lumps, blocks, mill ends, bleeder waste — regardless of size and whether rigid or soft.

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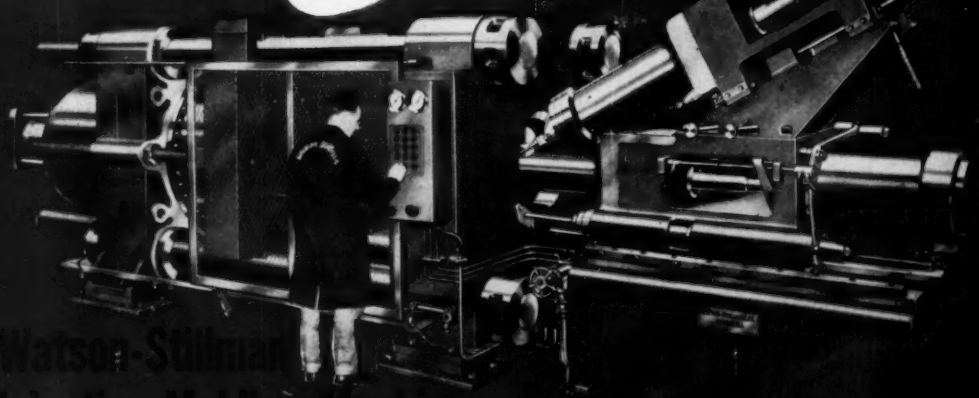
CABLE: CHEMPROD BROOKLYN

Inaugurating a new era in plastics molding

the new 300 oz.



Watson-Stillman Injection Molding Machine

DIE SPACE 48" x 72"

NEW ECONOMY... NEW FLEXIBILITY

Significant evidence of Watson-Stillman's ability to anticipate and meet critical requirements of plastics molders is the record-smashing 300-ounce Injection Machine ... NOW—READY FOR YOU.

Fifty per cent larger than its largest predecessor, this 300-ounce unit opens new vistas in every department of plastics products development. For the designer, larger biggest moldings, heavier sections when needed, greater metering capacity. For the production chief, lower operating expenses and lower maintenance per pound, details of production. For the management greater PROFITS, through broadened scope of facilities, improved competitive position, and all the other advantages of

WATSON-STILLMAN

HYDRAULIC [illegible]

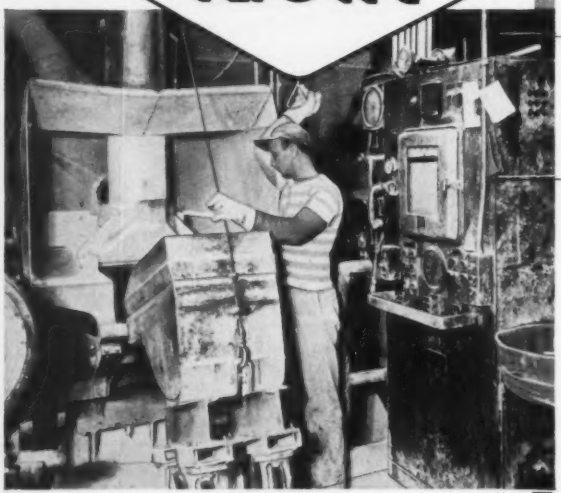
Branch Offices: Chicago, Ill. Manufactured in Canada by [illegible]

Foreign Sales Representatives: [illegible]

FOR 1 TO 300 OUNCE MOLDINGS—the
W-S COMPLETELINE—the shortest distance between production and profit

cut mixing time and boost your production with easier-processing

PLIOVIC



One to two minutes less time here means greater production and more profits, thanks to PLIOVIC

USE PROVED *Products*

When you switch to PLIOVIC—Goodyear's vinyl chloride copolymer—you get all these advantages:

Faster Mixing in the Banbury

—shave from 1 to 2 minutes off your mixing time, increasing your rate of production

Reduce Plasticizer Requirements

—more efficient internal plasticizing action of PLIOVIC means you need from 5% to 10% less scarce plasticizer to get same degree of flexibility compared with other similar resins

Process at Lower Temperatures

—because of their chemical composition, PLIOVIC resins can be milled, calendered or extruded at lower temperatures—20° to 40° lower, on the average, thanks to greater thermoplasticity

More Economical Compounds

—plasticized PLIOVIC compounds can be loaded with extender pigments with less sacrifice of physical properties than with similar resins

Good Physical Characteristics

—PLIOVIC resins have high strength properties, toughness at low temperatures, good heat stability, good light stability, high resistance to flex-fatigue and excellent chemical resistance

You can put these advantages to work lowering your costs in such items as calendered films, sheeting and flooring; and extruded hose and tubing. Ask for details on PLIOVIC in any of its three forms—PLIOVIC A, a general-purpose resin; PLIOVIC AR, similar to PLIOVIC A but with a reduced bulking value . . . and PLIOVIC AO for organosols.

For full details, and samples for your evaluation, write today to:

GOODYEAR, CHEMICAL DIVISION
AKRON 16, OHIO

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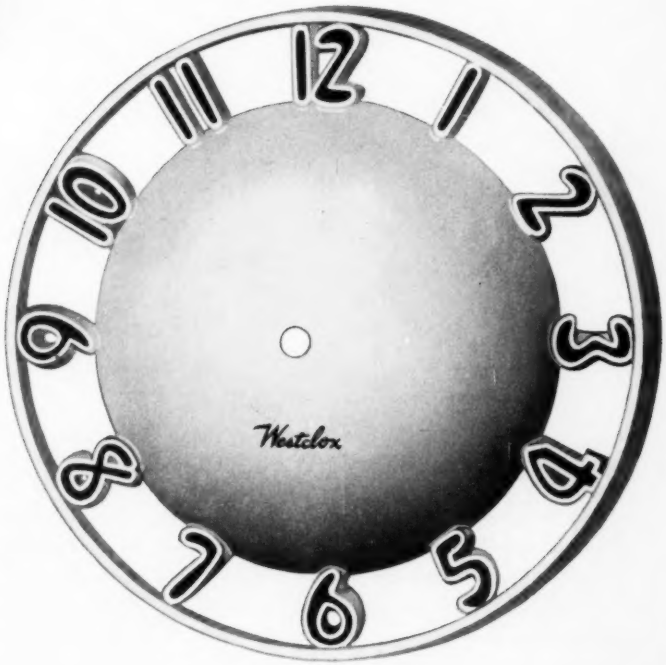
Where time is money

. . . It's PLASTICS every time!



Time is big money to Westclox—and this up-to-the-minute new electric Westclox Melody is on its way to a sales record. It's a brilliantly-styled decorator's ideal—with a reversible or removable case ring to change its appearance at will. It is very appealingly priced. And there you have two of the many reasons why—no matter what your product—moulded plastics by Kurz-Kasch deserve your most careful appraisal.

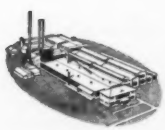
The entire clock case—numerals and all—is a 1-piece compression moulded job. Because of its color range, dimensional stability and characteristic of preserving its soft, lustrous finish when cleaned with any fluid, the material is urea. Numeral colors are masked and sprayed on—the trademark color is quickly rolled on the raised letters.

Simple? Sure—when you know how to do it! At Kurz-Kasch we try—by design and materials—*to make every job as simple as possible.* That's the best way to keep your costs in line. And we work as hard on that as we do in excelling in quality—or on our punctuality in fitting shipments into our customers' production schedules to the best of our ability.

Our specialty is thermosetting plastics—from phenolics to Teflon and moulded glass-filled polyester. We have researched and developed new methods and new uses. We would like to discuss this with you.

Kurz-Kasch

FOR OVER 35 YEARS PLANNERS AND MOULDERS IN PLASTICS



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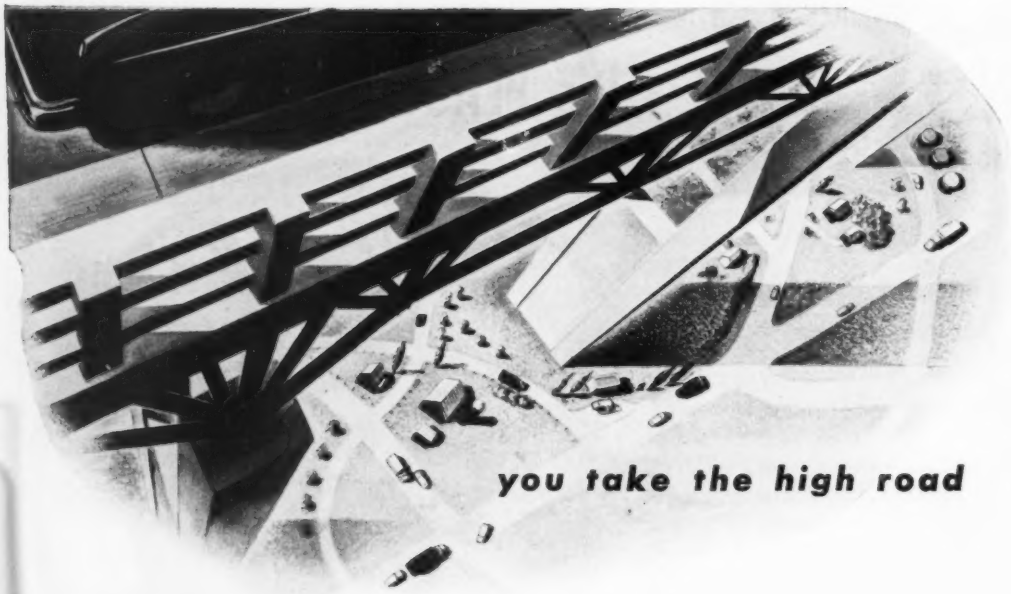
BRANCH SALES OFFICES: New York, *Lexington 2-6677* • Rochester, *Hillside 2415M* • Chicago, *Harrison 7-5473* • Detroit, *Trinity 3-7050* • Philadelphia, *Granite 2-7484* • Dallas, *Logan 5234* • Los Angeles, *Prospect 7503* • St. Louis, *Delmar 9577* • Toronto, *Girard 9711* • **EXPORT OFFICE:** 89 Broad Street, New York City, *Bowling Green 9-7751.*

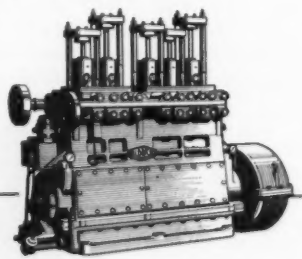


It's the short way home . . . when the high road means a straight line and a through-flow of traffic. It means too that you can get more work done today . . . and still more tomorrow.

Designed to give virtually the same results, the Aldrich Direct Flow Pump passes liquid *directly* through the working barrel. Aldrich design engineers have successfully eliminated two right angle turns in the fluid-end block.

This design, resulting in a reduction of "loss space", means more work done at less cost. Volumetric efficiency is improved and materials are saved. In each size, you get a smaller pump that does the same work better . . . which is why more people are coming to Aldrich for pumps made in 3″, 5″, 6″ triplex; 5″, 6″ quintuplex and 5″, 6″ septuplex units . . . to meet medium-to-high pressure and capacity requirements.

Applications include: molding, extruding and other operations requiring hydraulic pressure . . . Aldrich designs and furnishes *complete* central hydraulic systems—incorporating Aldrich Pumps, accumulators, alleviators and control systems. Write for Data Sheets.



THE ALDRICH PUMP COMPANY

...Originators of the Direct Flow Pump

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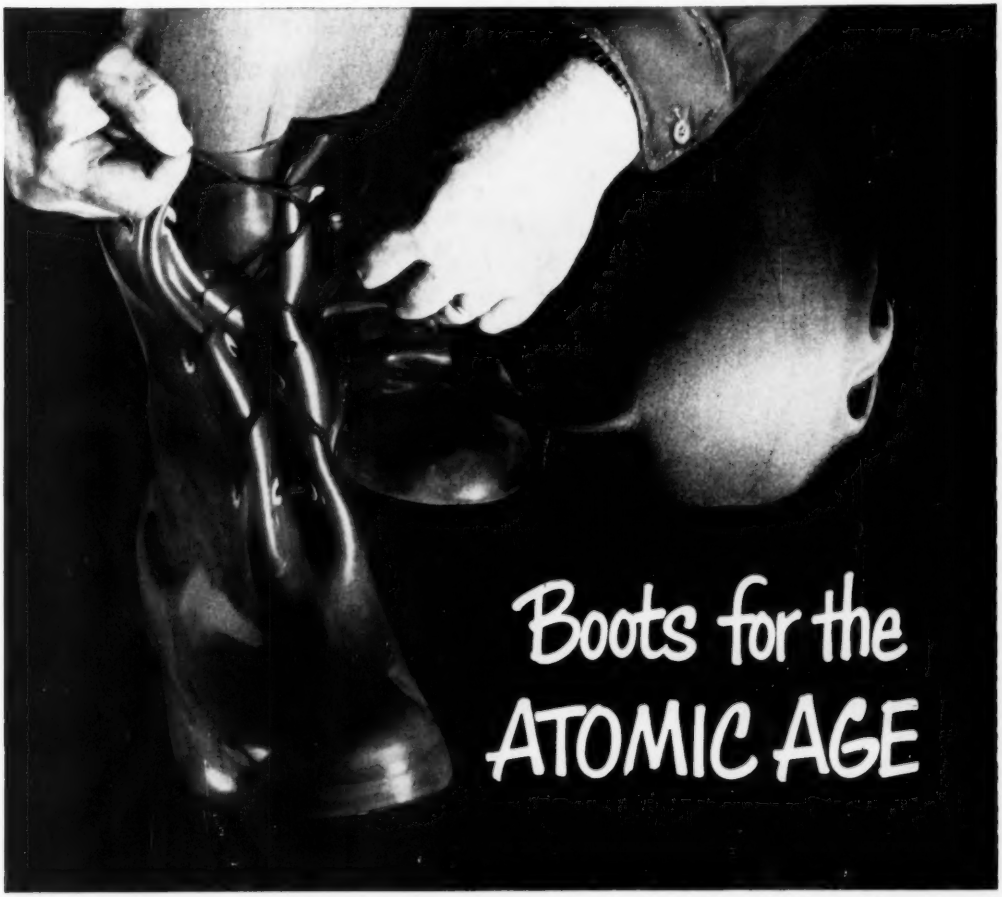
Representatives: Birmingham • Bolivar, N. Y. • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit Duluth • Houston • Jacksonville • Los Angeles • New York • Omaha • Philadelphia • Pittsburgh • Portland, Ore. Richmond, Va. • St. Louis • San Francisco • Seattle • Spokane, Wash. • Syracuse • Tulsa • Export Dept.: 751 Drexel Building, Phila. 6, Pa.

Another successful development using AMERICAN ANODE *materials*



AND right for the times! They are decontamination boots made of American Anode plastisols and worn over regular Army issue shoes. They are protection against all kinds of chemicals, including radioactive materials and, of course, are made to be disposable after one wearing.

They resist grease, oil and acids. They are flame resistant and fight abrasion of stones and rough terrain.

Here's another indication of the range of items that American Anode can produce. Virtually anything that can be made from, or improved by the use of plastisols, can be designed and made for you by American Anode . . . plastisol gloves, sinus masks, rubber-coated chains, bellows, many items that will fit into a defense economy.

It shows, also, the versatility of American Anode plastisols. They are ideal for dipping, coating or spreading—for casting or molding many finished items. They can be compounded to resist oil, acid, chipping and more damaging conditions. No solvents needed—no fire hazard. A wide color range is available.

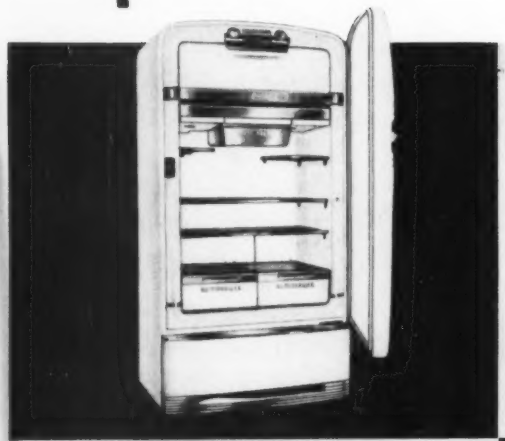
Write for information. We can supply materials, or take over the complete job for you—from design to delivery. Please address Dept. AC-3, American Anode Inc., 60 Cherry Street, Akron, Ohio.

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS, AMERAN RESIN PASTES, COMPLETE MANUFACTURING FACILITIES

If It Must Be Exact - Call On Bridgeport

plastic perfect!

When you need *plastic at its best*, let Bridgeport handle your moulding. We are now moulding plastic parts that meet closest tolerances, and stand up to severest specifications in famous products in every field. What's the secret? We simply have the wide range of equipment, machinery, and facilities to give *every* problem *exactly* the right treatment. Nothing is forced to "do" the job. Our scope and experience is based on tested facts, not theory. We know plastics. So be *sure*. Consult Bridgeport *first!*



Write today for full information

BRIDGEPORT MOULDED PRODUCTS, INCORPORATED

BOX 3276-O BARNUM STATION BRIDGEPORT 5, CONNECTICUT

COLOR

DURABILITY

TOUGHNESS

LIGHTWEIGHT

STYLE

AN OPEN-AND-SHUT CASE OF *Good Design*

No matter how you look at it, the Lady Betty Lunch-N-Bag, designed by Sundberg-Ferar, is an outstanding new use for Hercocel* A. Open, this smart new accessory reveals itself to be a well-integrated combination of purse and lunch box (fitted with standard vacuum bottle). Shut, and slung over milady's arm or shoulder, it's a handsome, high-styled handbag with a rich brown finish in gleaming plastic. Both inside and out, it's built for long-time service and satisfaction. Little wonder the current demand for this attractive new product far outstrips supplies!

Lunch-N-Bag is another example of the way Hercules materials and facilities contribute to the development and production of new and better things made of plastics. Our design and technical staffs invite your inquiries on "Hercocel" A or other Hercules Cellulosic Plastics.

Please address inquiries about the new Lunch-N-Bag to the manufacturer—Landers, Frary & Clark, New Britain, Conn.

***HERCULES POWDER COMPANY** Cellulose Products Dept., 916 Market St., Wilmington, Del.*

HERCULES Cellulosic Plastics

*TRADEMARK

Molded by Wolverine Plastics, Inc., Milan, Michigan, with "Hercocel" A (cellulose acetate molding powder).

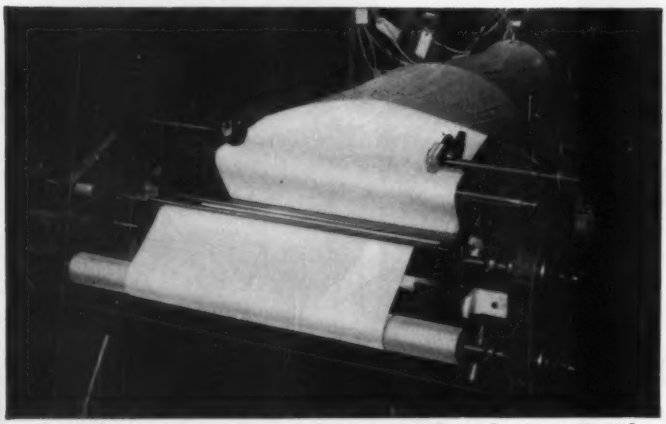
CP51-5

PLASTICS MACHINERY BULLETIN

Reporting News and Machine Design Developments

IN BUSINESS TO **NRM** REDUCE YOUR COSTS

NEW! VINYL SHEETING EXTRUDED WITH LOW-COST INSTALLATION



New NRM extruder produces sheeting in thicknesses of .005″ to .015″, and a possible .020″.

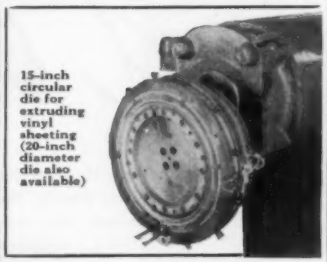
The first machine to extrude heavy-gage polyvinyl-chloride sheeting (.005″ to .015″ —.020″) has now been developed and tested at NRM's laboratories. Cost of a complete unit is but a fraction of the cost of a calender installation.

Quality of the extruded sheeting is equal or better than that of sheeting produced by calenders. Gage tolerances are broader, and output speeds less. Thus the economy of the new method can best be realized on applications where high speed and close tolerances are not imperative.

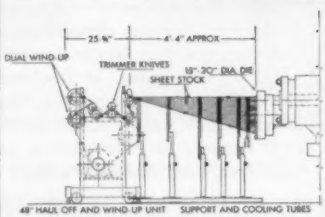
Overall length of the unit, including drive, is approximately 21 feet.

NRM also produces a unit for the extrusion of thin-wall expanded polyethylene and PVC tubing for wall thicknesses from .001″ up.

Write for complete information. Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.



15-inch circular die for extruding vinyl sheeting (20-inch diameter die also available)



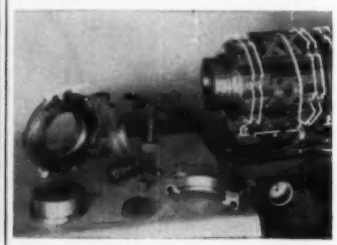
Extruder head and haul-off unit.

ELIMINATES PREDRYING SIMPLIFIES COMPOUNDING AND COLOR BLENDING

The new NRM two-stage single-screw extruder, which eliminates the need for initial compounding and drying, has been applied successfully for the extrusion of pre-blended wet acetate, acrylic, and polystyrene compounds to be pelletized direct at the die or in a chopper. It can now be applied for the direct extrusion of certain finished products. Thus compounds can be made to specifications quickly from a simplified inventory of basic materials such as resins, plasticizers, stabilizers, fillers and dyes, and a finished product can be obtained from one machine.

New Nylon Extruder

The NRM simplified, rugged, split-front flange arrangement holding a standard die gate or PVC crosshead can be removed readily and replaced with a band heater,



NRM 2½″ Model "50" die gate, sub-die, strainer plate and split-type front flange as removed from cylinder front end of a 2½″ extruder. A nylon crosshead or nylon die can now be bolted direct to the cylinder face.

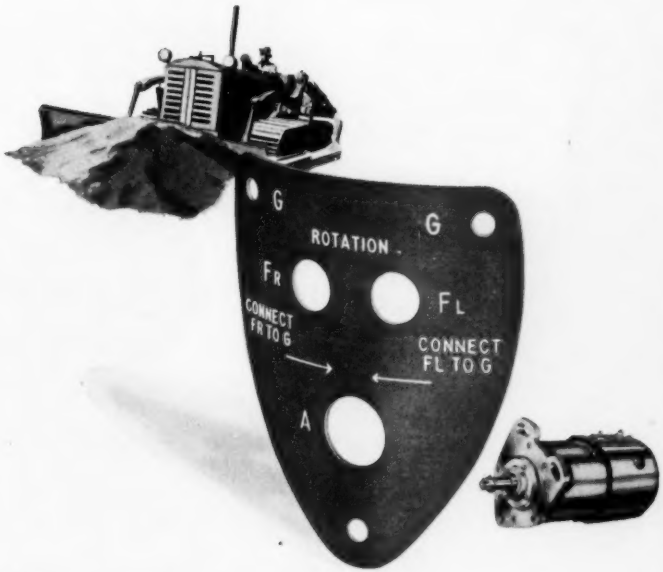
when the small *Nylon* die or *Nylon* crosshead is bolted directly to the face of the cylinder. This avoids critical temperature variations resulting from heat losses of the flange.

For complete details, write Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.

NATIONAL RUBBER MACHINERY CO. General Offices & Engineering Laboratories Akron 8, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Calif.
EXPORT Plastics Machinery: OMNI EXPORT CORPORATION
460 4th Ave., New York 16, N. Y.

Creative Engineering



How to move mountains—non-stop

When it comes to moving mountains—or spreading the landscape around—you can't beat bulldozers.

You can, however, beat a bulldozer if you put into it a part that can't stand the gaff.

An example is the generator. Vibration, abrasive dust, weather, shifting stresses and stray oils or greases are constantly taking their hardest licks at it. It leads a tough life.

That's why American Bosch Corporation, makers of dust-proof, heavy-duty generators for industrial tractors and bulldozers, selected Synthane laminated plastics for the insulation plate shown above.

Synthane is a material for industry. It possesses an unusual *combination* of physical, mechanical, chemical and electrical properties.

Synthane is light, strong, dense, abrasion resistant. It is easily machined or produced in formed shapes. Dielectrically strong, it is a natural for electrical applications. Synthane is corrosion and fungus resistant, chemically inert, stable over a considerable temperature range.

If this capsule description of Synthane excites your imagination, send for the complete Synthane catalog. Synthane Corporation, 8 River Road, Oaks, Pennsylvania.

PLASTICS WHERE PLASTICS BELONG

SYNTHANE

Events of Major Importance

THE FESTIVAL OF BRITAIN

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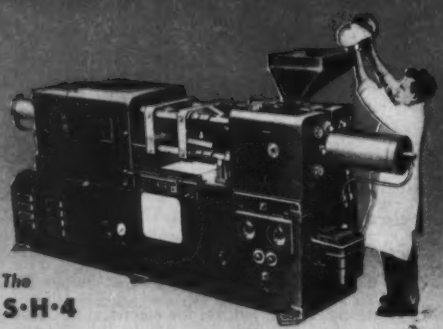
April 30th — May 11th

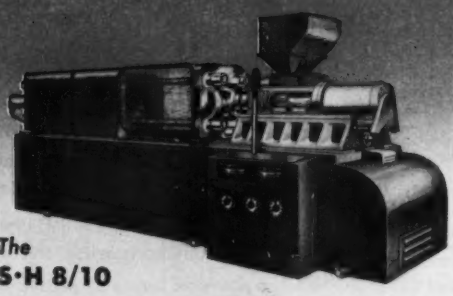
Windsor's

BRITISH PLASTIC EXHIBITION
OLYMPIA
June 6th — 16th

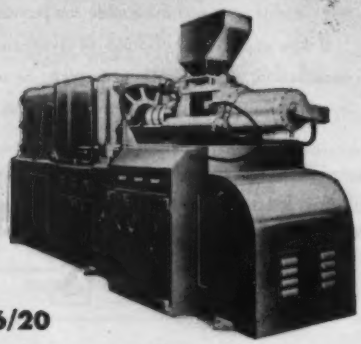
A RANGE OF INJECTION MOULDING MACHINES



The
S·H·4
AUTOMATIC CONTROLLED CYCLE



The
S·H 8/10
INJECTION MOULDING MACHINE



The
S·H 16/20
WITH AUTOMATIC TIME-CYCLE CONTROL

★ If you are NOT VISITING BRITAIN be sure to inspect our Range of Exhibits at the CANADIAN INTERNATIONAL TRADE FAIR May 28th—June 8th

★ PERFORMANCE
★ VERSATILITY
★ LOW OPERATING COSTS

Windsor's

HOLD EXCLUSIVE MANUFACTURING RIGHTS FOR MULTI-SCREW EXTRUSION MACHINES Under I·M·P Patents

compounds
extrudes
colours
reclaims scrap

R·C·65 (65 lbs.)
TWIN-SCREW EXTRUDER

R·C·100 (100 lbs.)
TWIN-SCREW EXTRUDER

R·C·200 (200 lbs.)
TRIPLE-SCREW EXTRUDER

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FOR INJECTION AND EXTRUSION

SERVING THE WORLD'S PLASTIC INDUSTRY

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FIGHT WASTE

with

DISSTON MOLD and HOB STEELS

Boost productive efficiency ... Cut production costs!

Increasing the production of plastics is of paramount importance today! This is a direct challenge to productive efficiency as well as to production capacity. It means making more with less by doing it more efficiently!

And, in the manufacture of plastic products, there is no factor of greater importance than the selection of mold and hob steels. The choice of the right steels not only helps eliminate production difficulties and assure a perfect product, it also helps keep manufacturing costs at their proper levels!

FIVE DISSTON STEELS FOR HOBS AND MOLDS

DISSTON PLASTIRON®: A low carbon iron; specially inspected to assure freedom from porosity, dirt, slag, or other impurities. Ideal for hobbing difficult shapes and for short run jobs.

DISSTON PLASTALLOY®: A low carbon-nickel-chrome mold steel, especially annealed to provide ease of hobbing. Develops an extremely hard, deep case having high resistance to swamping and erosion.

DISSTON PLASTIKUT®: A "cut mold" steel with alloy content for maximum core and case strength. Because of its hardness, Plastikut must be machined. But its ability to stand up under long runs makes its use economical.

DISSTON NICROMAN: An extremely tough steel which will harden completely through from a low temperature. Particularly suitable for difficult hobs—designs which include small lugs, thin sections, and difficult angles.

DISSTON CROLOY: An air-hardening steel for special applications. Has been applied with particular success to forces, punches, and machined molds designed for long runs, and for use on more abrasive materials.

Determining which of these Disston Steels will best suit your needs may require careful analysis. Disston metallurgists and engineers will be glad to assist and advise you without obligation. Write, outlining your problem; all correspondence handled in strict confidence.

Disston's "Fight Waste" Plan for Tool Steel Users

Help stretch the supply of available Tool Steels! Disston will send you—FREE—individual fact cards covering six basic types of Tool Steels. Each card contains information on the selection, working, and application of the subject steel to help you get better performance and longer tool life—to help you cut waste of vital steels!

ORDER CARDS BY NUMBER IN QUANTITIES DESIRED

No. S-1 High Speed Steel, Tungsten-Molybdenum Type (*Comparable to DISSTON 6-N-6*)
No. S-2 Water-Hardening Carbon or Carbon-Vanadium Tool Steel (*Comparable to DISSTON Best Tool or Vatool Steel*)
No. S-3 Air-Hardening, High-Carbon, High-Chromium Steel (*Comparable to DISSTON Croloy*)
No. S-4 Oil-Hardening Tool Steel (*Comparable to DISSTON Mansil*)
No. S-5 Chrome-Tungsten Chisel Steel (*Comparable to DISSTON Keystone*)
No. S-6 Nickel-Chrome, Oil-Hardening Tool Steel (*Comparable to DISSTON Nicroman No. 827*)

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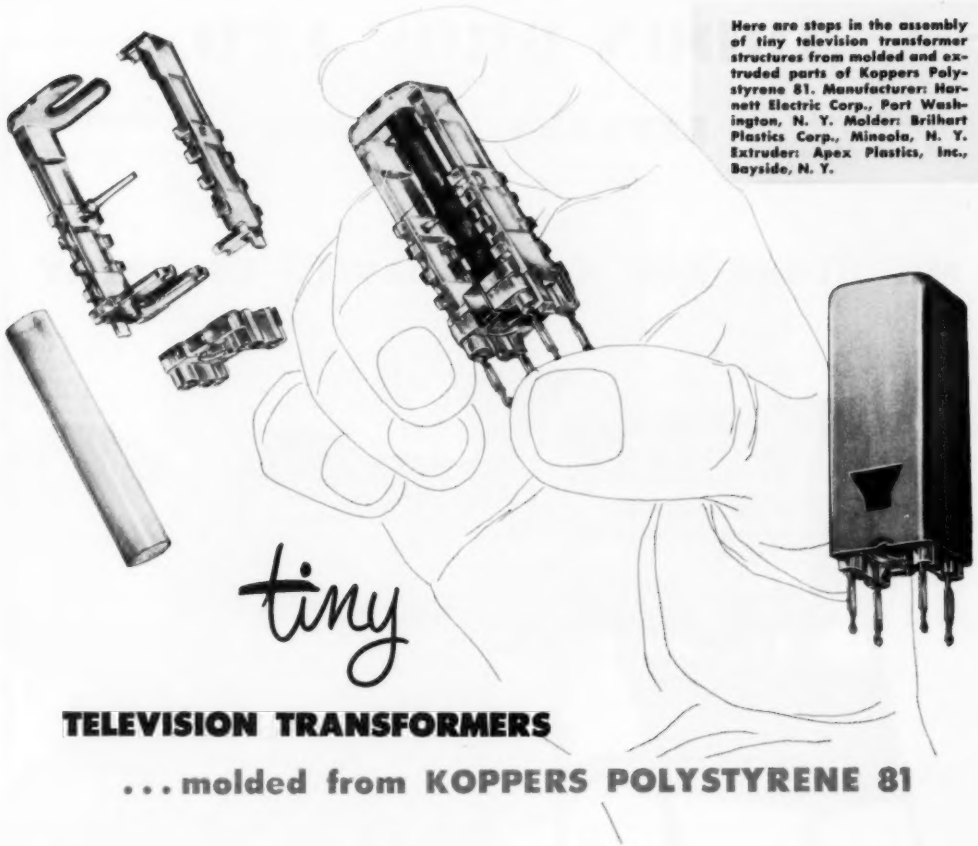

Here are steps in the assembly of tiny television transformer structures from molded and extruded parts of Koppers Polystyrene 81. Manufacturer: Harnett Electric Corp., Port Washington, N. Y. Molder: Brilhart Plastics Corp., Mineola, N. Y. Extruder: Apex Plastics, Inc., Bayside, N. Y.

tiny

TELEVISION TRANSFORMERS

. . . molded from KOPPERS POLYSTYRENE 81

EIGHT different types of television transformer structures are made from molded and extruded parts of Koppers Polystyrene 81 by Harnett Electric Corp., Port Washington, N. Y. These lightweight, low-cost assemblies are key parts in several leading makes of television receivers.

With top performance their primary consideration, Harnett engineers picked Koppers Polystyrene 81 for its high heat distortion point—chassis temperatures often reach 140°F. They picked Koppers Polystyrene 81 for its dielectric strength — dielectric loss and power factor are both extremely low in the high frequency range.

Economy, clarity and wide range of colors, though secondary in importance, were plus values from the use of Koppers Polystyrene for this job.

Since supplies are limited by defense measures, it is important to get best use of the available Koppers Polystyrene. Our engineers will be glad to work with you toward that end.

KOPPERS

Koppers Perfected Plastics

Koppers Polystyrene has made Many Products Better and Many Better Products Possible.

KOPPERS COMPANY, INC., Chemical Division, PITTSBURGH 19, PA.

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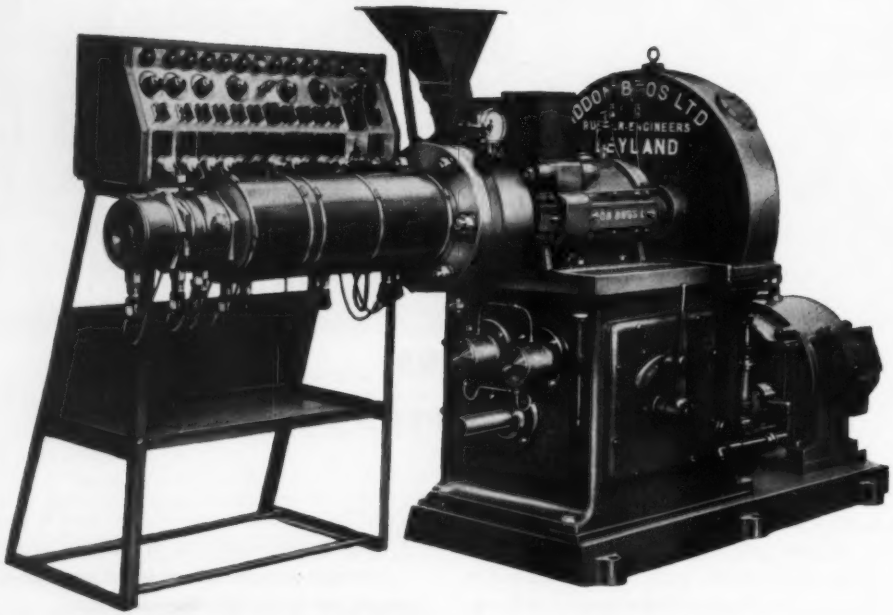
MAKERS OF

MACHINES FOR THE PLASTICS INDUSTRY



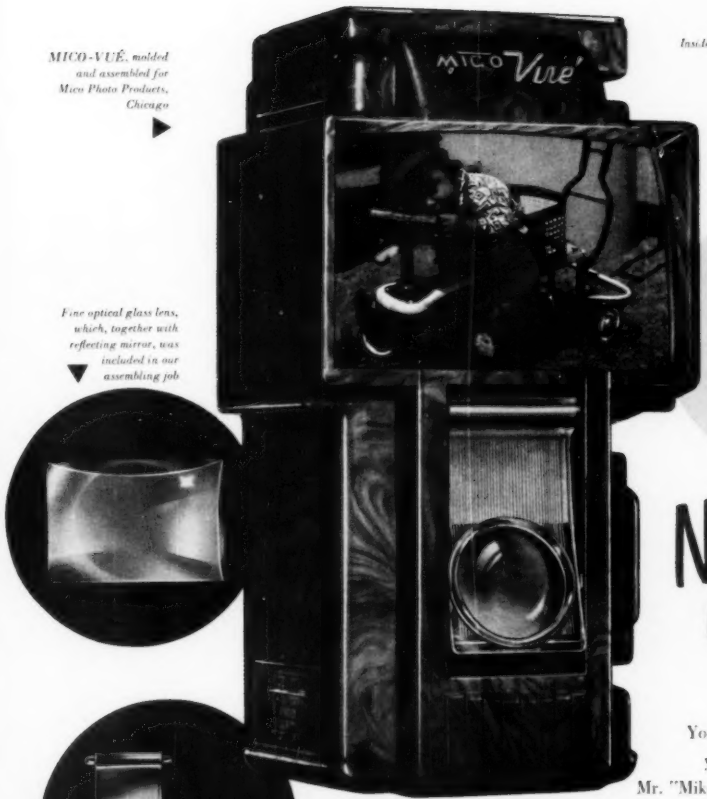
4½" Electrically Heated Plastic Extruding Machine fitted with Temperature Control Panel, Vibratory Feeder, and Straightway Head

OVER 60 YEARS EXPERIENCE
IN THE DESIGN AND MANUFACTURE OF

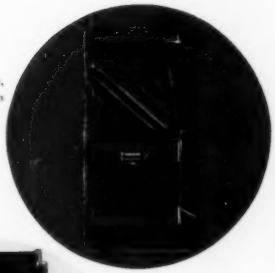
CALENDERS — MILLS — PRESSES — EXTRUDERS — Etc.

ENABLES US TO OFFER A RANGE OF MACHINES WITH A SALES RECORD BUILT ON COMPARISON

MICO-VUÉ, molded and assembled for Mico Photo Products, Chicago



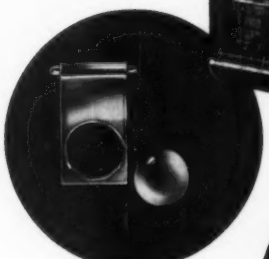
Inside side-section view, note insets



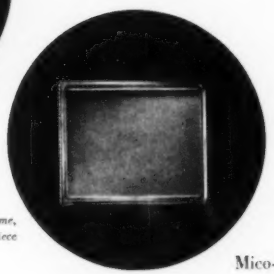
Outside side-sectional view, note design detailing

Fine optical glass lens, which, together with reflecting mirror, was included in our assembling job

Baby picture, Santa Fe Photo



Plastic lens hinged mount for magnifying glass



Plastic diffuser and frame, molded in one piece

NEW VIEWER

New View on what Plastics Can Do

You can draw some profitable conclusions for your own plastic products from these views of Mr. "Mike" Wolk, president of Mico Photo Products.

Mr. Wolk said he wanted his viewer to be plastic not only because of the lower production cost, but for the greater attractiveness and color variety which he felt plastics afforded over other materials.

This, then, was a complete start-to-finish molding and assembling job for us. Everything that went into this new viewer except its fine precision optical lenses and metal slides was made of plastic.

Economy and strength were the factors in molding the Mico-Vué with a minimum number of castings. The light diffuser and frame were molded in one piece for greater economy and more attractive appearance. Even the lens hinge mounts were molded.

Although this viewer is new, the idea of doing a thorough engineering and molding job economically and beautifully is an old story with us.

We'd like to tell you that story and show you how we can serve you. Just let us know when we may. We'll do the rest.

Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about ~~CHRO-PLASTIC~~ piping, tubing and fittings, write for circulars containing data and illustrations.*

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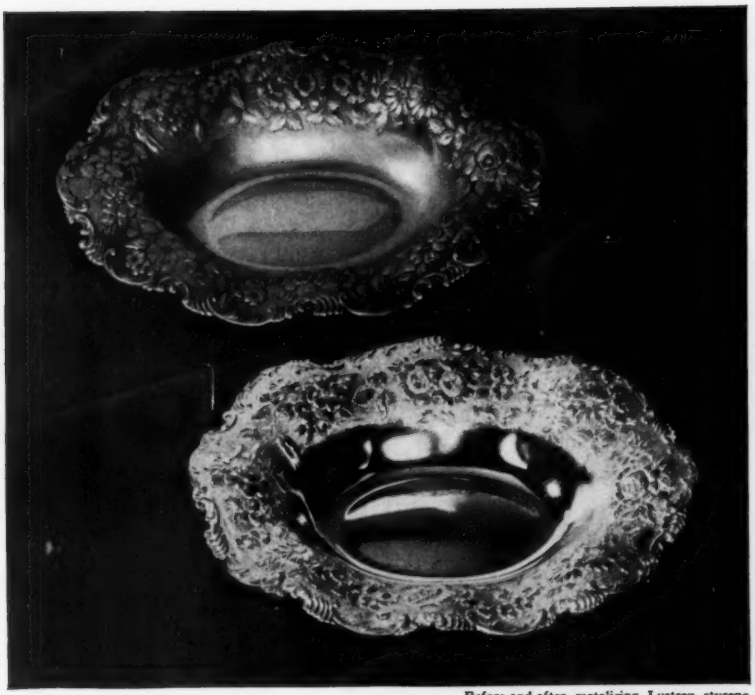

Before-and-after metalizing Lustrex styrene plastic. Tray by Nalle Plastics, Inc., Austin, Texas.

4 methods of metalizing Lustrex styrene plastic

In many applications, metalizing Lustrex styrene plastic combines the appearance of a real metal surface **WITH** the many advantages inherent in a styrene molded product: less weight, better design possibilities, and lower cost.

Four common methods of metalizing styrene are discussed in a new Monsanto booklet just off the press on after-treatment of molded styrene parts. We'll be happy to send you a copy.

Remember, too, Monsanto produces not only Lustrex styrene plastic, but a whole *family* of plastics. A versatile family which most likely includes the type of plastics materials which you are now using . . . or will possibly use in the near future.

Lustrex: Reg. U. S. Pat. Off.

For your free copy of "Decorative Treatments for Lustrex Styrene Plastic" and for information on Monsanto's full range of plastics, send the coupon below.

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☐ Please send me your booklet, "Decorative Treatments for Lustrex Styrene Plastic."
☐ Please send me information on the Monsanto family of plastics.

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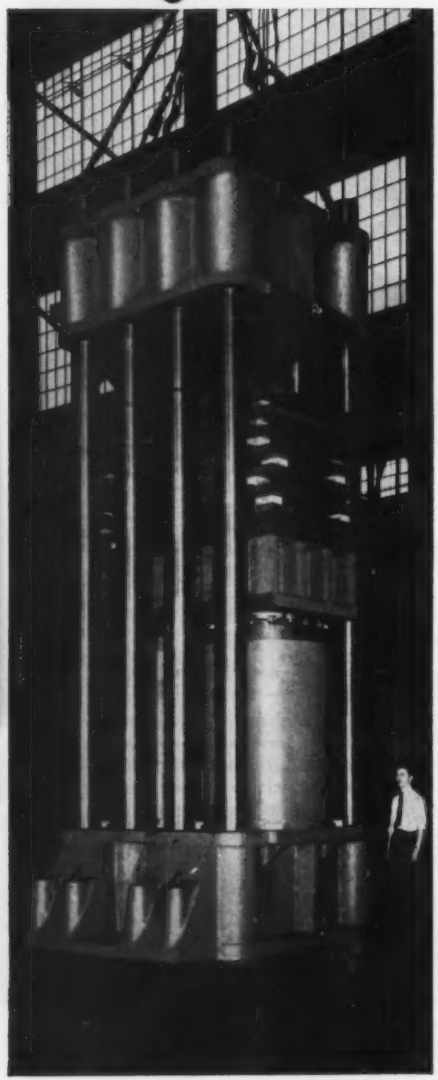
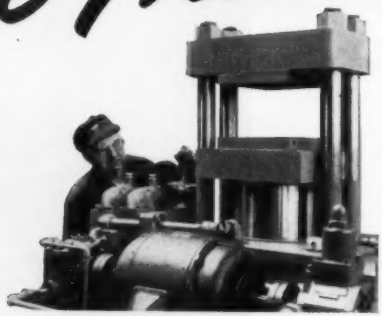
Hydraulic Presses





Built the Way You Want Them

You probably have very definite ideas about the press or presses you're now planning. If the building is entrusted to Bethlehem, you're going to get exactly the job you want, down to the last small detail.

Nobody here will try to sidetrack you. Nobody will try to sell you a different idea. If it develops that your design requires new patterns, new types of castings, they will be provided. No matter what forgings are needed, we can make them quickly and easily. When the assembly stage is reached, the work will be supervised by men who have lived with this kind of work for many years.

You'll find, too, that Bethlehem's engineers work smoothly with your own. They can, in fact, design the entire press if you want them too—everything subject, of course, to your final approval.

Bethlehem builds presses in hot-plate, molding, and metal-forming types, in a wide range of sizes, with or without self-contained or separate power system. Get in touch with us the next time you're in the market. You'll like the many services we offer.

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On 51 Cars

—MORE THAN EVER—

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The photograph of these typical PLEXIGLAS automotive parts shows the beauty, but *not* the ease of molding—the sparkling appeal, but *not* the permanence of PLEXIGLAS. Remember this, too; *perfectionists* build America's motor cars. And PLEXIGLAS acrylic molding powders meet their rigid requirements! The demand for PLEXIGLAS molding powder currently exceeds supply. We suggest you investigate this material for your defense applications or for other future uses. Experimental quantities are available.

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ACTUAL PHOTOGRAPH OF WELDING ENGINEERS MODEL 2041 COMPOUNDER EXTRUDER PRODUCING MEMOBELTS AT DICTAPHONE CORPORATION'S BRIDGEPORT, CONNECTICUT, PLANT.

Mile after mile of DICTAPHONE's new Memobelts tell a success story which typifies the contribution of WELDING ENGINEERS advanced equipment in the highly competitive plastics field. It met Dictaphone's rigid finished-product specifications . . . producing Memobelts of exceptionally close tolerances, micro-smooth surfaces and consistently high tonal quality. In addition to a higher production rate, the rugged design of Welding Engineers equipment played an important part in Dictaphone Corporation's decision.

WELDING ENGINEERS DUAL WORM COMPOUNDER-EXTRUDERS*

WHATEVER the specifications of your compounded-extracted-extruded plastic product, it's almost a sure thing that the installation of Welding Engineers custom-fitted equipment will result in great savings. *We look forward to being "Partners In Production" with your Company, too.*

*Patents Pending and Issued

MACHINERY DIVISION

WELDING ENGINEERS, INC.

BOX 391, NORRISTOWN, PA.

Welding Engineers is one of America's Leading Steel Fabricators and Machinists Serving The Chemical and Plastics Industries

With the multitude of applications that phenolic materials are used for, it's no wonder there frequently is confusion on the part of the molder about which specific phenolic formulation to choose for best results.

Usually it boils down to selecting a phenolic that offers the best compromise of characteristics—impact strength, heat resistance, curing time, flow, dielectric properties. And that's why Plenco phenolics are so often the choice for "difficult" jobs. Besides offering a wide range of general purpose phenolics, Plenco specializes in compounding materials that exhibit outstanding properties in one or two directions, plus a good balance of other important characteristics.

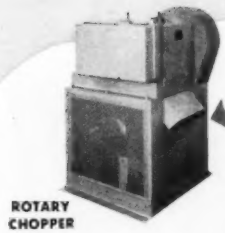
FOR SOLUTIONS TO YOUR PROBLEMS

When your choice is a Plenco special purpose material, you're never attempting to force a square peg into a round hole. The characteristics of these plastics have been carefully scrutinized, so their suitability for a particular job is easy to pre-determine. If you need help in finding a phenolic for an unusual job, chances are we can be of service.

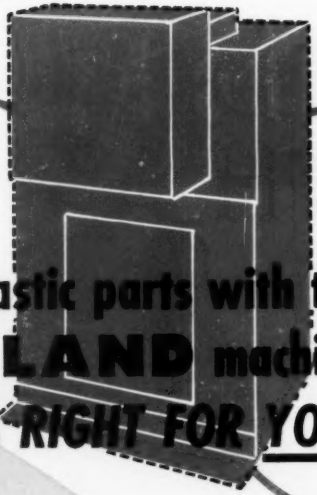
PLENCO PHENOLICS

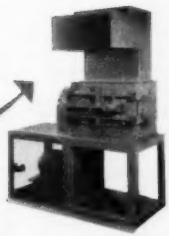
. . . black, browns, mottles and colors in General Purpose, Heat Resisting and Medium Impact grades. Special Purpose Molding Compounds and Resins are produced to fulfill special molding requirements.

PLASTICS ENGINEERING CO.
Sheboygan, Wisconsin



ROTARY CHOPPER



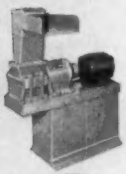


PREBREAKER

Cut up large plastic parts with the CUMBERLAND machine that's RIGHT FOR YOU!

PELLETIZER

CUMBERLAND GRANULATING MACHINES

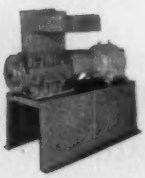


MODELS 0, ½, 1½

Small and medium capacity. Direct coupled for central grinding. V-belt driven for use beside each injection machine. Request Bulletin 250.

MODEL 10

Large 6" x 10" throat opening. For use beside each injection molding machine. Rugged, efficient, and easy to clean. Write for details.



MODEL 18

Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin 250.

YOU'LL SAVE MONEY, CHOP UP PLASTIC MORE EFFICIENTLY WITH A CUMBERLAND MACHINE THAT'S BUILT-FOR-THE-JOB

Your plastic reducing problems can only be solved by a machine designed to meet *your* needs..

Because Cumberland engineers realize this fact, they have designed and manufactured a complete line of plastic reducing machines — each built to perform better under specific operating conditions.

Let us know your requirements. We'll be glad to analyze your needs and recommend the Cumberland machine that's exactly right for you!

QUICK FACTS ABOUT CUMBERLAND MACHINES

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ROTARY CHOPPER: Versatile heavy duty machine. Cuts thick vinylite slabs. For other applications, request Bulletin 400.

PELLETIZER: Pelletizes plastic material from continuous extruders.

Write now for complete details!

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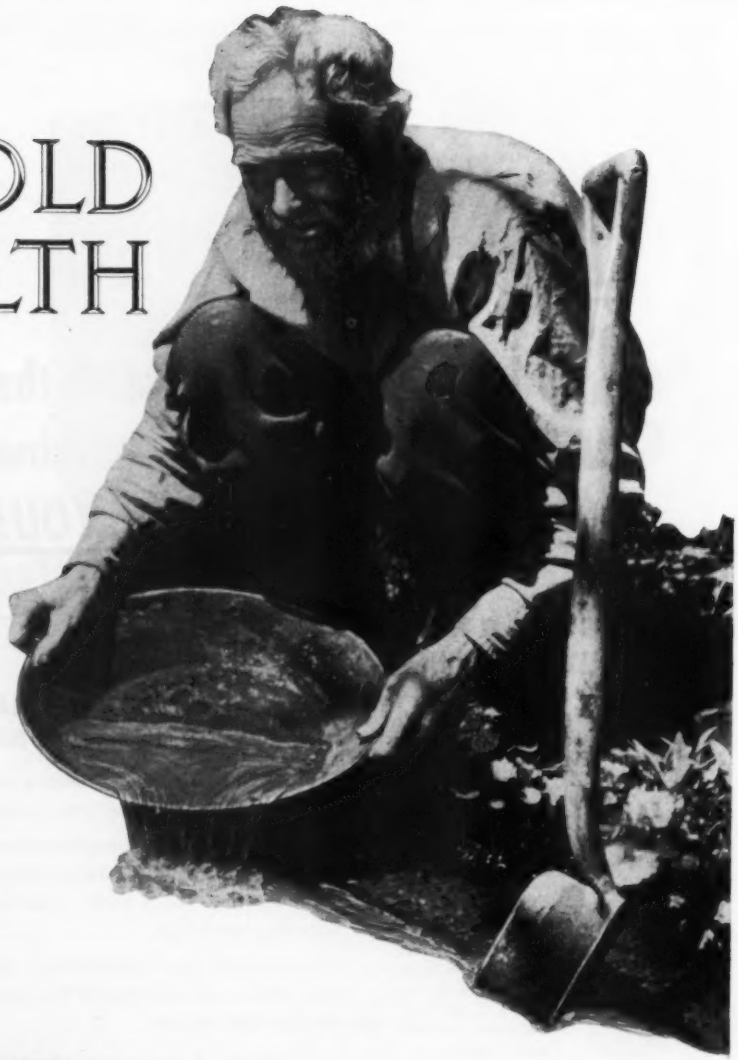

. . . may lie buried beneath the surface — needing only knowledge for its development. An idea, too, may need only the technical knowledge to turn it into a highly salable product. Columbia will be happy to put that knowledge at your service.

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GERING has the RIGHT PLASTIC for your PRODUCT

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Whatever your problem, there is a Gering laboratory tested material to make your molding easier . . . to make your product do the job right and look its best! For quality, faster molding cycles, uniformity and service — be sure to check Gering *engineered* plastic materials — all backed by years of accurate plastic know-how. Bring your production and selection headaches to Gering for an immediate and tested solution that will bring big dividends in production!

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GERING THERMOPLASTICS
are available for
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- Polyethylene
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Our laboratory and technical service staffs have the answers to your problems.

GET MORE SALES APPEAL with
Color
by GERING

Good products need good colors for that additional boost in sales appeal. Gering specialists take considerable pride in their accurate color matching and reprocessing and coloring of all plastics. Fully toned colors in brilliant contrasting shades are available at Gering for transparent, translucent, and opaque materials. See Gering for that full rich coloring to insure that extra sales appeal.

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Until now, General American's Plant No. 1 was one of the most modern and versatile plants in the plastics industry . . .

Now, the opening of the new Parrish Ave. Plant combined with Plant No. 1 gives General American facilities unmatched anywhere.

Parrish Ave. specializes in injection molding. Presses range from 48 oz. to 300 oz. An overhead crane supplies materials. Continuous conveyors take the finished products away. Reinforced plastics molding is also housed there.

With Plant No. 1 (2 oz. to 48 oz. injection; 100 to 2,000 ton compression; low pressure molding; painting and metallizing)—an impressive tool shop—and these new facilities—you'll find General American your one complete source for plastics molding.

PLASTICS DIVISION
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TRADE MARK

MORE MEN AND MACHINES TO PRODUCE YOUR PRODUCTS BETTER

COMPRESSION

DIE-MAKING

for civilian and for defense production....

PLASTICS DIVISION • GENERAL AMERICAN TRANSPORTATION CORPORATION

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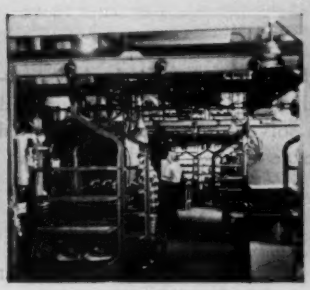
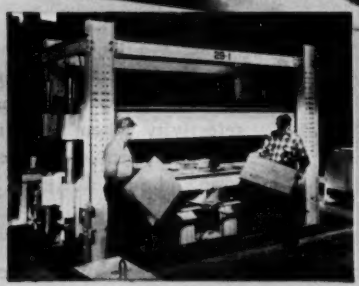


PAINTING



48" x 144" LOW PRESSURE MOLDING of reinforced plastics supplemented by smaller presses.

see General American

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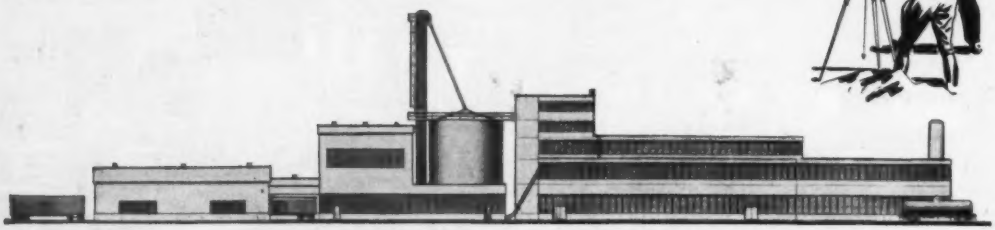
Building Your Future



Artist's Drawing Of New Furfural Plant Under Construction
Omaha, Nebraska

QO FURAN CHEMICALS

Completion of a new furfural plant late this year will greatly expand the production of this important basic chemical. Raw material for its operation will be agricultural residues, the supply of which is replaceable yearly.

Now is a good time to see if research on the use of furfural will pay off for you as it has for many others. Here are some of the reasons for furfural's growing industrial acceptance:

1. ***Chemical Properties***—Besides undergoing general reactions of aldehydes, furfural may react through its heterocyclic nucleus. The furan ring is amazingly stable or easily ruptured depending on reaction conditions employed.

2. ***Physical Properties***—Its highly polar molecule gives exceptionally good selectivity when used in solvent refining of petroleum, vegetable oils, rosin and other mixtures.

3. ***In Resins***—Furfural is an economical source of aldehydes for the preparation of resins. The furan ring exerts a modifying effect on the resultant resins and improves flow properties, chemical resistance and wetting.

4. ***As A Solvent***—Furfural is a powerful solvent and in some cases actually may be reacted with the solute, thus becoming an integral part of the final product.

Now is the time to find out about furfural.
Write for Bulletin 204 describing its uses.

QO **The Quaker Oats Company** CHEMICALS DEPT.

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Through Maximum Efficiency

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The Projectile & Engineering Co. Ltd. manufacture a range of Injection Moulding Machines from 2 oz. to 16 oz. capacity, designed to meet the most exacting requirements of the Plastic Industry. They are self-contained with automatic cycle, and hydraulically operated. They have a high plasticising capacity and rate of injection. Mould-locking pressure and platen area enable them to operate at a high rate of production.

MOULDS

PECO MOULDS. Expert Designers and mould makers are employed and moulds can be supplied to samples submitted, including die-sinking models if desired. An important side of the Company's work is the hobbing of cavities for moulds and medallions — the plant includes a 3,000-ton Hobbing plant. Master hobs to customers' samples made as required.

Full particulars of our range of Injection Moulding Machines and Moulds will be sent on request.

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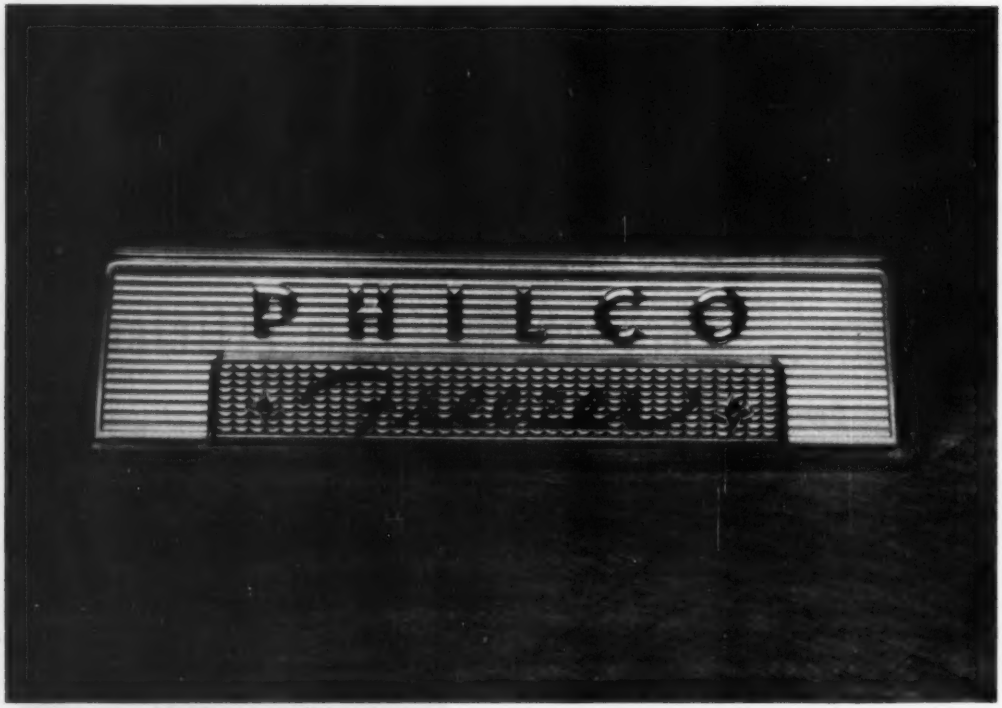

PLASTICS FOR INDUSTRY

The above illustration shows the Acrylic nameplate currently being produced for PHILCO and used on their 1951 refrigerator line.

The actual size is 10" x 2-1/2", molded in a two-cavity die and decorated by CRUVER'S "Bas-Releef" Process in transparent red for the word "Freezer", gold lacquer in the panel around the word "Freezer", the word "Philco" in bright-gold and the balance of the background in aluminum lacquer.

It is colorful, decorative and also another example of CRUVER'S "Bas-Releef" work for the appliance industry.

CRUVER

MANUFACTURING CO.

2460 W. JACKSON BLVD., CHICAGO 12, ILL.

BRANCH OFFICES

DETROIT MINNEAPOLIS NEW YORK

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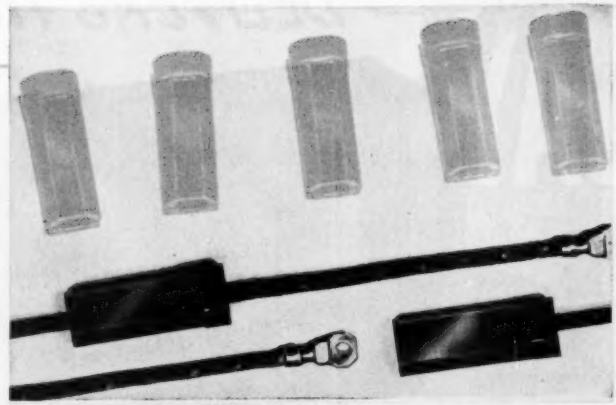
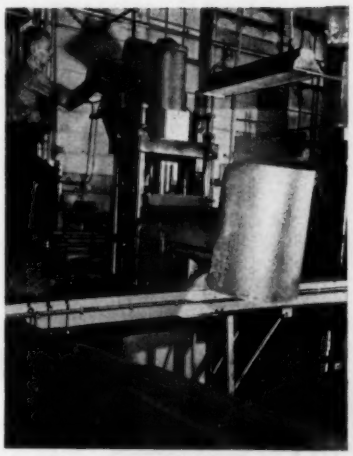
Automatic Molding

...cuts labor
...cuts costs
...cuts investment



Plastic Insulators for electrical connections, shown in connected and disconnected positions, used in quantities for lighting and other connections on automobiles . . . made by Wade on Stokes Presses.



One of the Stokes 741 fully automatic molding presses at Wade Electric Products Company, Sturgis, Michigan. Parts drop on conveyor belt, thence to tumbler. Occasional filling of hopper is the only regular attention required.

Each unit in this installation of Stokes 741 automatic molding presses produces approximately 40,000 parts per hour which are automatically conveyed to a tumbler to remove flash.

The part is an insulator for an electrical connector, small but complex, previously considered impossible to produce automatically.

The Stokes 741 fully automatic molding press assures high production of perfect, uniform parts, and takes the place of a large plunger press with its preform press, electronic preheater, and the full-time and part-time operators required to run it.

In automatic operation one man periodically fills the hoppers with molding powder and removes the finished parts; otherwise no attention is needed.

Let Stokes experts judge from parts or blueprints if your products qualify—or can easily be re-designed for—the high production and large savings per unit which are possible by automatic molding. Or send for a 24-page brochure on Fully Automatic Molding.

STOKES

STOKES MAKES

Plastics Molding Presses,
Industrial Tabletting
and Powder Metal Presses,
Pharmaceutical Equipment,
Vacuum Processing Equipment,
High Vacuum Pumps and Gages,
Special Machinery

F. J. STOKES MACHINE COMPANY, 5934 TABOR ROAD, PHILADELPHIA 20, PA.

DAY — DELIVERS THE GOODS!

DAY SPECIAL BLENDER

Compounding phenolic plastic moulding powders is no job for ordinary blenders. It calls for special engineering—the kind on which the DAY reputation is built.

RUGGED CONSTRUCTION includes use of heavy steel plate for the 1000-gallon tank and a husky, welded vibrationless steel frame.

DESIGN FEATURES include specially constructed stuffing boxes and heavy-duty outboard bearings . . . a DAY Spiral Type Agitator for constant lateral and radial movement to assure fast, thorough mixing . . . a special DAY valve at the bottom of the tank for easy discharge.

EFFICIENT OPERATION is assured by the powerful 40 HP motor, geared to rotate the agitator at the proper speed for efficient blending at a reduced cycle of operation.

If you have a plastics production problem, the odds are that DAY equipment, either standard or engineered to order, will supply all the answers. See your J. H. Day Sales Engineer or write direct. The J. H. Day Co., Inc., 1148 Harrison Ave., Cincinnati 22, Ohio.

DAY offers a complete line of Mixers, Dispersion Mills, Mixers, and Mixers for the Plastics Industry.

DAY

THE J. H. DAY COMPANY, CINCINNATI 22, OHIO
INCORPORATED

These are the special purpose steels that set Crucible apart from most other steel companies. For these special steels must be so carefully compounded, and so sensitively handled that, in most cases, they cannot be mass produced.

Such steels include those designed for use under severe conditions of heat or cold, stress, strain, or wear. For example: Crucible high-speed tool steels are in the whirring machines that cut and shape the toughest metals; Crucible hollow drill steels work around-the-clock digging mines and quarries, and Crucible stainless steels put a sparkle with a purpose in our kitchens.

If you have an application that calls for a special steel, Crucible's metallurgical staff stands ready to help you. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

CRUCIBLE first name in special purpose steels

51 years of Fine steelmaking

Syracuse Works, Harrison, N. J. • Midland Works, Midland, Pa. • Park Works, Pittsburgh, Pa. • Spring Works, Pittsburgh, Pa.
National Crown Works, East Lingraan, Ohio • Sanderson-Halcomb Works, Syracuse, N. Y. • Trent Tube Company, East Troy, Wisconsin

You saw this ad in the Saturday Evening Post, Time, Newsweek, Business Week

especially tool steels!

Crucible Tool Steels have been pampered pets every day of the 51 years Crucible has led in this highly specialized field. That's why tool steel users, assured of getting what they want from Crucible, have kept us the country's number one tool steel producer.

Since Industry is constantly opening new fields that require new tool steels, Crucible's interest in their further development and improvement goes on unabated. You can profit from the wealth of knowledge gained by Crucible in the application of these steels to thousands of uses. The unparalleled experience of our metallurgists is freely available to you.

That's why it pays to get *all* your tool steel requirements from Crucible.

write for your selector today

If you haven't gotten your handy tool for selecting tool steels, write: Dept. MO, Crucible Steel Company of America, 405 Lexington Avenue, New York 17, New York

3 colors, 9" diameter

CRUCIBLE first name in special purpose steels

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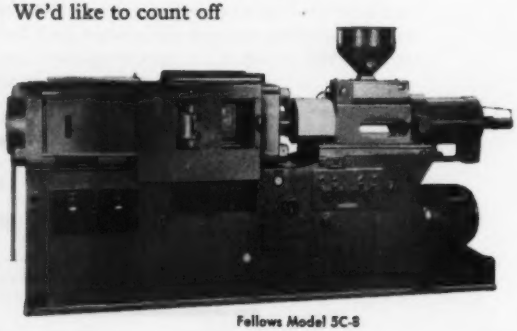
O.K., Bud, where's the fire?

'Over the speed limit' is just normal going for the speed-cycling Fellows 5C-8. Up to six shots per minute, dry run, and top-rating plasticizing capacity... these are two of 11 reasons for pinning your faith to Fellows. Special advanced engineering pays off in extra molding shop profits. We'd like to count off the 11 points with you.



Fellows Model 5C-8

Fellows
LEOMINSTER
injection molding equipment

THE FELLOWS GEAR SHAPER CO., Plastics Machine Div., Head Office & Export Dept., Springfield, Vt. Branch Offices: 616 Fisher Bldg., Detroit 2. 840 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1 • New England Distributor: Leominster Tool Co., Leominster, Mass.

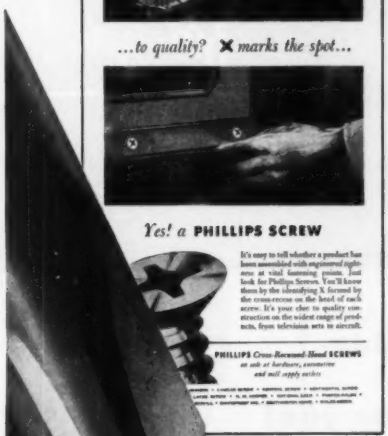
Can this clue to quality be found

on your product?

Can you find the clue...

...to quality? ✕ *marks the spot...*

Yes! a **PHILLIPS SCREW**



Part of the series of advertisements on Phillips Screws appearing in The Saturday Evening Post.

PHILLIPS SCREWS, with their identifying X formed by the cross recess, are recognized on sight as a mark of quality in well built products. The general public knows that Phillips Cross-Recessed-Head Screws make products stronger, better looking. 14 million readers of *The Saturday Evening Post* are being told that when it comes to assurance of quality, *X marks the spot.*

These screws cut driving time up to 50%, set up tighter, resist vibration. They are distinctively designed to give maximum strength of head, maximum driver strength. They eliminate driver skids and split screw heads. Whether you use Phillips wood screws, machine screws or tapping screws, you build a better product and you save time, work, money.

PHILLIPS *Cross-Recessed-Head* SCREWS

✕ *marks the spot... the mark of extra quality*

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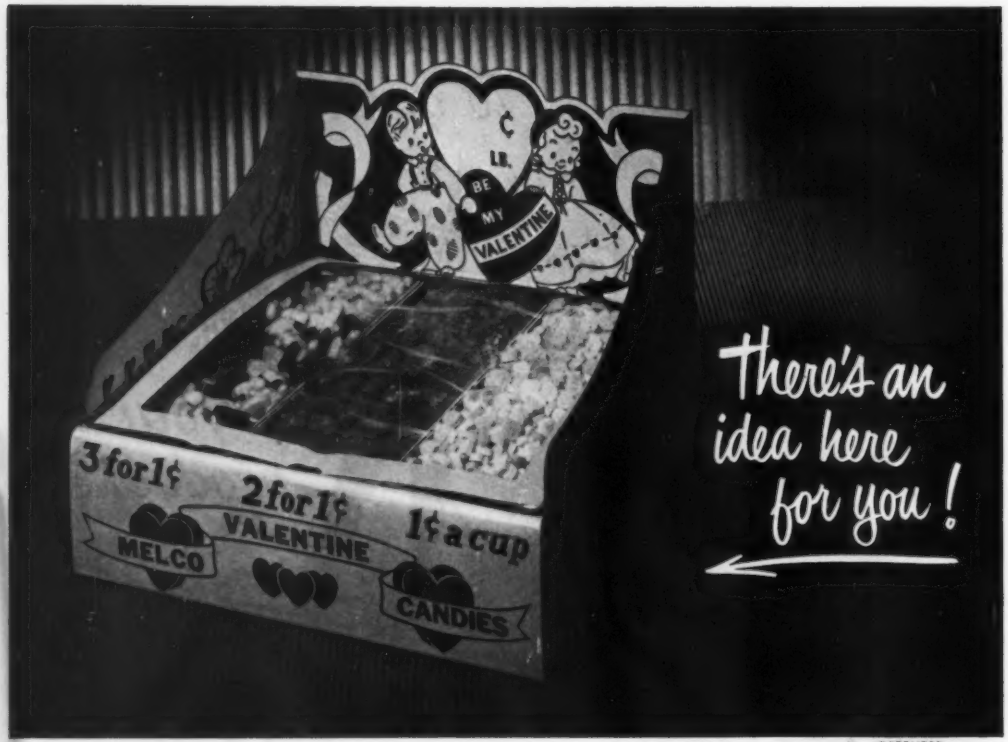
THE FASTENERS OF TODAY . . . AND OF THE FUTURE



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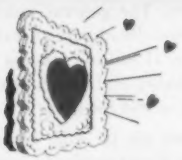

Roses are red
Violets are blue
Displays like this
Make sales for you!

Here's a "Valentine" that *dealers* love—a clever display packed with tempting Valentine candies. It's a combination sure to brighten any youngster's eye. And *that's* sure to brighten the day's cash register figures! This H & D display is a favorite of manufacturers, too, because it combines a shipping box with an effective point-of-sale display at an over-all saving.

H & D's book, "Pack to Attract" shows dozens of ways better packaging can help you, through better display . . . lower packaging costs . . . increased sales . . . better product protection. For a copy, write Hinde & Dauch, 5103 Decatur St., Sandusky, Ohio.

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HINDE & DAUCH
Authority on Packaging

FACTORIES IN: Baltimore • Buffalo • Chicago • Cleveland Detroit • Gloucester, N. J. • Hoboken, N. J. • Kansas City, Kan. Lenoir, N. C. • Richmond, Va. • Sandusky, Ohio St. Louis • Watertown, Mass. *Offices in principal cities.*

WHAT THEY'RE* USING FOR HIGH STRENGTH PARTS

.... *and why!*

*** BULLDOG ELECTRIC PRODUCTS COMPANY**

ROGERS RM-12338

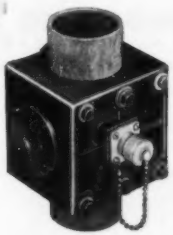
PART: Vacu-Break Switch Head

MOLDER: The RICHARDSON COMPANY

Strength and toughness to withstand punching, fabricating and riveting operations after molding.

Reduced the number of parts used in forming the head, thus effecting a substantial decrease in labor costs.

Mandatory for operation of Vacu-Break Switches that material used in HEADS have unusual stability and not be affected by atmospheric conditions.



*** AMERICAN PHENOLIC CORPORATION**

ROGERS RM-15000E

PART: Antenna coupling for Signal Corps

High impact strength.

Part, weighing one pound, was drop-tested from heights of 12 feet. Did not chip or crack.

*** LIONEL CORPORATION**

ROGERS RX-421

PART: Housings, switch bases, coil forms

Stands up under the shock of trimming and riveting on a punch press.

Provides a firm, non-cracking grip for self-tapping screws, eliminating need for metal inserts.

Smooth, gleaming surface assures eye appeal for visible components.

Write for "Here's Rogers and Its Fiberloys" — Dept. P, Rogers Corporation, Manchester, Conn. This entertaining booklet will help you decide if our plastics and other Fiberloys by Rogers have a place in your products.

Better Parts for Better Products

ROGERS
CORPORATION
Established in 1832

Peace Be With You!

Here's a man at peace with himself and the world—for a while anyway.

He is now buying molded plastics parts—and they come to him ready to assemble.

No more stamping, filing, drilling, tapping, sand-blasting, painting, with tote boxes piled between each operation for someone—probably this very guy—to keep moving on schedule.

It might just probably be he has put the final crown on his peace of mind by turning the whole problem over to Boonton, leaving just a phone call once in a while to confirm his good judgment.

After all, 30 years in business in one place, in their own plant, constantly growing, should mean security for their customers.

Certainly a lot of them think so.

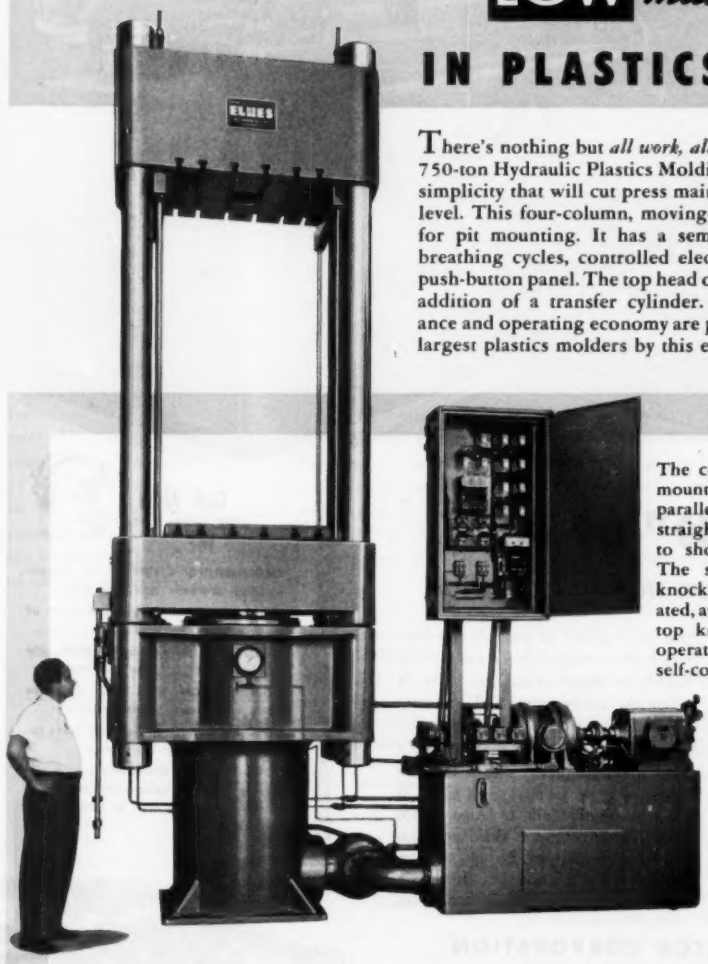
BOONTON MOLDING CO.
BOONTON, NEW JERSEY
N. Y. Office—Chanin Bldg., 122 East 42nd Street, Murray Hill 6-8340

Elmes SIMPLICITY OF DESIGN

assures HIGH productivity

LOW maintenance cost

IN PLASTICS MOLDING



There's nothing but *all work, all the time,* in this new ELMES 750-ton Hydraulic Plastics Molding Press. Here is engineered simplicity that will cut press maintenance cost to rock-bottom level. This four-column, moving-up type press is constructed for pit mounting. It has a semi-automatic cycle, with two breathing cycles, controlled electrically from the convenient push-button panel. The top head of the press is arranged for the addition of a transfer cylinder. Outstanding press performance and operating economy are provided for one of America's largest plastics molders by this efficient Elmes design.

The control box of this press is mounted at floor level. It mounts parallel to the press, although a straight-on view is used in photo to show the electrical controls. The specially designed bottom knockouts are hydraulically operated, automatically controlled. The top knockouts are mechanically operated. The pumping unit is self-contained.

For complete press satisfaction in either a standard or special-built design, "Put Your Pressing Problems Up To Elmes." Our recommendations are yours for the asking. Write for Bulletin 5200-A, "Elmes Hydraulic Equipment for the Plastics Industry."

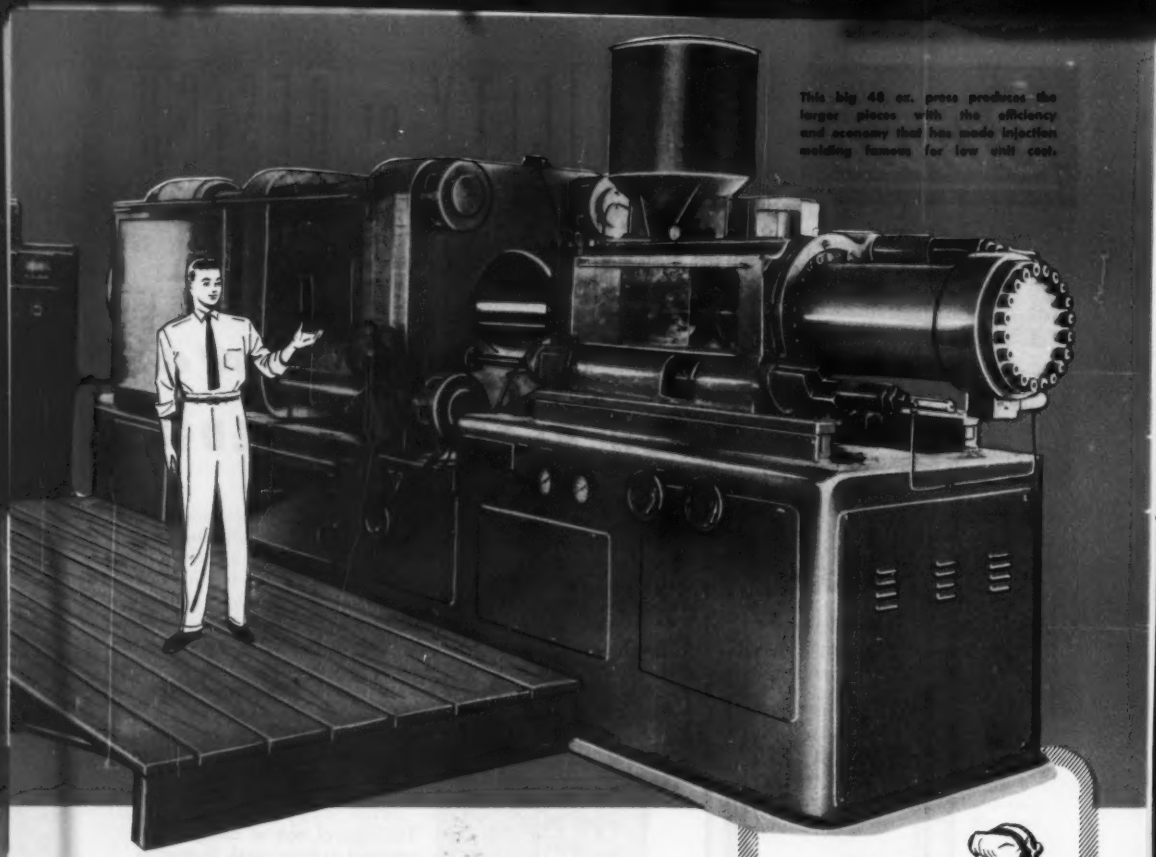
AMERICAN STEEL FOUNDRIES • ELMES ENGINEERING DIVISION

NEW PLANT ADDRESS . . . 1159 TENNESSEE AVENUE, CINCINNATI 29, OHIO

Distributors in Principal Industrial Centers • Also Manufactured in Canada

ELMES 100th Anniversary 1851-1951 HYDRAULIC EQUIPMENT

METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES



This big 48 oz. press produces the larger pieces with the efficiency and economy that has made injection molding famous for low unit cost.

a "press-fit" at Aico

cuts cost of injection molded plastics

Unused press capacity means a high unit cost. Aico avoids this waste to cut costs on all injection molding. Aico has a press to fit each job. A big one for a big job . . . a little one for a little job . . . Aico has at least one press that's just right to meet your design and delivery requirements when operated at its most efficient production rate, full capacity

A fully equipped injection molding department, with presses from 2 to 48 oz. capacity, offers a plus value you can't afford to miss. It provides you with a single source for a wide variety of injection molded parts. It offers the convenience and economy of working with a single supplier.

No other plastic molder has a more modern plant . . . a broader range of experience . . . to place at your disposal. Talk to Aico about your plastic problem. We'd appreciate the chance to be of service. There's no obligation . . . drop us a line today. Let Aico take over for you.

AMERICAN INSULATOR CORPORATION
NEW FREEDOM, PENNSYLVANIA

Call AICO
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for . . .

ENGINEERING COUNSEL on proper molding methods and materials.

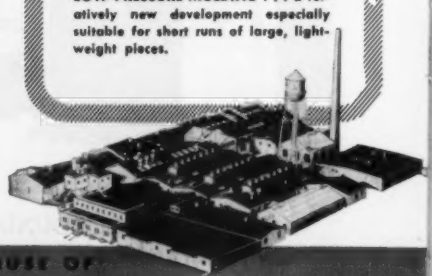
MOLD BUILDING to avoid division of responsibility.

INJECTION MOLDING for high rate of production . . . low unit cost.

COMPRESSION MOLDING of large parts with heavy cross sections.

COLD MOLDING of electrical parts requiring high heat resistance.

LOW-PRESSURE MOLDING . . . a relatively new development especially suitable for short runs of large, lightweight pieces.



MANY THINGS ARE BETTER BECAUSE OF

Aico PRECISION MOLDED plastics

A SPECIAL SERVICE TO MODERN PLASTICS READERS, REPORTING AND INTERPRETING THE LATEST NEWS AND DEVELOPMENTS FROM WASHINGTON AND ELSEWHERE AS THEY AFFECT THE PLASTICS INDUSTRY AND THE MOBILIZATION PROGRAM

Modern Plastics BULLETIN

April 15, 1951

What Goes On in Phenol?

The phenol situation is currently among the most jittery of any supply problems affecting the plastics industry. The jitters are caused by a lack of knowledge over where the present huge output of phenol is going, and a lurking suspicion that within a few months time supply may be running ahead of demand.

April is tightest month for phenolics

As a result of the phenol scarcity, phenolic resins were "tighter" in April than any time in the recent past. All signs indicate that the shortage will continue into May with a probable easement in June. The over-all picture indicates that the total poundage of phenol-formaldehyde resins in the first six months of 1951 will be about the same or a little less than in the *first* six months of 1950, which, of course, is considerably under the volume produced in the *last* six months of 1950. The table herewith gives an idea of the breakdown:

Average Monthly Phenolic and Other Tar Acid Resin Production in 1950

	First six months average	*Second six months average*
	lb.	*lb.*
Laminating[a]	5,600,000	6,500,000
Adhesives	2,200,000	2,700,000
Molding material	17,400,000	19,000,000
Miscellaneous	4,800,000	6,100,000
Protective coatings	1,700,000	2,000,000

[a] Only 70% of the laminating resins are derived from phenol—the remainder come largely from cresol and other tar acid resins. Furfural-formaldehyde resins are also included in these figures, but their volume, although sizable, is not great enough to upset the trend.

Phenolic plastics other than molding compounds

There is little doubt that synthetic phenol has been diverted in large quantity to forms of phenolic resin other than molding powder. Phenolic adhesives, for example, increased from a monthly production of around 2 million lb. in the first half of 1950 to 3½ million in December; a low figure in July pulled down the last six-month average. The phenol used in this 1½ million lb. increase per month would have made over 3 million lb. of molding powder. Plywood production, where most of these adhesives are used, has increased from a little over 1 billion board ft. in 1945 to an expected 2½ billion in 1951, an increase of 100 million over 1950. Furthermore, about 25% of all plywood is estimated to be on DO order!

Phenolic for binders

The figure for miscellaneous compounds has grown from around 4 or 5 million lb. monthly to over 6 million—almost 7 in some months. The phenol used for this increase would make 4 to 6 million lb. of molding compound monthly. The biggest portion of this miscellaneous increase is believed to be binder resin for mineral insulation, but resins for wood waste and foundry cores are also coming along fast. Currently the volume for these new developments is low, but the foundry core application in particular could get mighty big mighty fast if the phenol were available.

The big increase in laminating resins involves so many materials other than synthetic phenol that it is difficult to determine how much it has cut into the phenol supply. It is bound to be plenty.

Phenol for petroleum, insecticides, chemicals

Other uses for phenol than the so-called plastics uses named above are also booming. In 1944 some 11 million lb. was used for petroleum refining and almost 6 million for disinfectants and insecticides. Both of these uses have been at least quadrupled. Total production of synthetic and natural phenol increased from 205 million lb. in 1944 to 310 in 1950. Exports of phenol in 1950 amounted to only 14 million lb. and over half that went to Canada.

The amount of all phenol used for plastics has fluctuated from about 60% to around 48%, but it

is significant that the 48% estimate was just about level in both 1949 and 1950.

New customers came in when phenol was slow

Probably the most disturbing factor in the entire phenolic resin picture is a marketing situation that began back in 1949 when molding powder production dropped to 5 million lb. in July. All types of phenol users had curtailed purchases, and some of them began to weep about the future. But strangely enough, several new and one or two older companies came into production about that same time with phenolic type resins for binders, plywood, and molding compounds. They bought most of their phenol from companies that had curtailed their own phenolic resin production. Plywood, mineral insulation fibers, and television cabinets were the chief products serviced by these expanding or comparatively new enterprises.

Phenol producers become captive plants

Then came the boom in phenolics along with nearly all other industrial materials. Most of the firms that produced both phenol and phenolic compounds diverted more of their captive phenol into their own phenolic products. One producer of phenol went into the resin business and diverted his entire phenol production to his own use. Another has diverted a large portion of his phenol to adhesives rather than molding compounds. In other words, *most of the phenol produced today is in the hands of producers who use most of it themselves, and an ever-growing portion is being diverted to resin other than molding compound.*

When do we get more phenolics?

It is expected that the molding material situation will be alleviated soon. The new Bakelite phenol plant, which the trade says will have at least a 60 million lb. annual capacity, is about ready to come in. Unless benzol becomes even more curtailed than it is now, it is believed that this new source of phenol will enable molders to count on all the phenolic molding compound they want by late summer or early fall.

Film Marketing Complicates Vinyl Outlook

The vinyl situation as a whole is just about as confusing today as it was at year-end, but several factors stand out more clearly.

First, it seems that the over-all excess demand for resin is more apparent than real. Some processors, especially certain calenderers, won't believe it.

Certain resin suppliers have better availability of chlorine, vinyl monomer and other raw materials than others. The particular vinyl processors, who are dealing with the resin suppliers who are short of these materials, are suffering to some extent. Meanwhile, the resin suppliers who enjoy better material availability still can't make enough resin to fulfill more than the requirements of their old contract customers, who are buying all they can.

Large vinyl film inventories

Plenty of signs indicate that there are large quantities of vinyl in inventory either in the shape of resin or finished film. The latter is largely in the hands of printers, converters, and in retail or wholesale hands—in fact, there is now a seasonal soft market in vinyl film at the retail level. The resin inventory is largely in the hands of a few calenderers who are gambling that there will be a tight resin situation in August and the usual great demand for film in early fall. Their reason for building a large inventory of resin now, even though demand for film is weakening, is their feeling that DO orders for vinyl *resin* will continue to increase so much that by fall the amount available for *film* will decrease.

Behind that reckoning is the knowledge that most DO orders for vinyl are for compounds used in wire coating, fabric coating, and molding.

Paradox in film prices

The reason for the paradox of low-priced film in the midst of what had appeared to be a severe scarcity of vinyl resin up until very recently, has unfolded as follows:

The spread in prices for vinyl film has varied as much as 10¢ per lb. for several months. This variation has been so severe that several calenderers have practically dropped out of the general film market and are now concentrating on specialty items such as film for baby pants, transparent sheet, and other products designed for special uses. Some film producers are still selling their product at around 65¢ and marketing it on a quality basis, but great quantities of general purpose film are now available at much lower prices.

Near capacity operation required from calenders

The reason for the present price situation seems to be that some of the calenderers are confronted with the necessity for keeping their product on the move. Their investment is huge—$250,000 per calender and up. At present they think they need a big resin inventory. A big outlay of capital is required to stay in business, so they operate their equipment at as near capacity as they can and sell their product for what the market will bring in order to keep cash handy for operating expenses.

Allocations

Teflon became the first plastic to go on complete allocation when on April 6, it was placed under Schedule 2 to NPA's basic Chemical Order M-45. Under Appendix A of that order, it is now necessary for purchasers to apply for authorization to accept delivery on Form NPAF-45 and suppliers must apply

on Form NPAF-46 for their authorization to deliver.

Nylon plastics will probably be ordered under allocation by the time this is printed, but the first allocation won't go into effect until June 1 since customers must be given 15 days to file their applications. Nylon is scarce because great quantities are needed for the Signal Corps wire program, and there are countless possibilities in other military uses. It's a fair guess that plans are being made for expansion, but it will take over a year to bring in any appreciable new amount.

Polyethylene may be allocated soon

Polyethylene also may be under allocation by June or July 1 despite the new production which is scheduled to come in during July—the situation grows hot or cold as the military alternately raise or lower their sights.

Ethyl cellulose too is still a possibility for allocation within a month or two—military procurement possibilities are again the uncertain factor.

Resorcinol is another possibility for allocation soon. The military are intensely interested in glue, and think a resorcinol glue line, when such things as, say, acrylic and wood are stuck together, is stronger than either material. In some places it may take the place of rivets. Demand *could* get much bigger than the present limited supply.

The situation in vinyl acetate is still on edge. The new Du Pont plant has been slow getting started on sizable production, and the need for polyvinyl alcohol, derived from vinyl acetate, is still great. Ten thousand lb. a month of the alcohol are being diverted by directive to the V-Box program. Government opinion is that present essential civilian needs and DO business for polyvinyl alcohol and acetate is in balance. Probably won't allocate—hope that new plant will take care of the situation.

A Pattern for Civilian Essentiality

The government has moved slowly in naming essential civilian items that ought to have preferred treatment in distribution of materials, but is gradually evolving a system under the name of "Program Rating" that is essentially an allocation method for essential civilian products. This is a junior grade Controlled Materials Plan and is separate from CMP. The first items to come under this program will be those products necessary for 1) transportation; 2) communications; 3) public health, which will include some pharmaceuticals; and 4) producing food products.

An example of the fourth is polyethylene in the food and agricultural field. A directive is about to be issued which will channel the same amount of polyethylene into frozen food packaging for home consumption that was used in January, 1950. This material will carry a DO 45 rating, which is a miscellaneous NPA rating that may be applied to a particular part of an entire industry. This particular rating for polyethylene will apply to tubing used for 4- by 2- by 0.0015-in. thick packages. The DO order can be extended by the manufacturer of the package to the supplier of polyethylene if it carries a certification to show that it is to be used for frozen foods to be sold at the household level.

This same type of regulation may also be applied soon to resins used for food can linings. Another variation may be applied to Order M-55 for electrical apparatus, not including wiring devices, for low voltage equipment. This would apply largely to phenolics used in circuit breakers, panel boards, etc. The phenolic industry could be swamped with DO's in this category.

The theory behind these moves is to see that plastics or other materials are channelled into essential uses. In practice, this philosophy will broaden the extent of the DO orders. If the DO orders become too great a part of one company's production, NPA can then apply order M-32 which automatically divides up the business by setting a percentage limit on the amount of DO orders which any one company is forced to accept.

Benzol For 1951

The following breakdown is reported from reliable sources to be the latest estimate for benzol *needs* in 1951:

Product	*Need (gal.)*
Phenol	50,000,000
Styrene	86,000,000
Aniline	18,000,000
Nylon	25,000,000
DDT	9,000,000
Maleic anhydride	9,000,000
Detergents	15,000,000
Miscellaneous	40,000,000
Total	252,000,000

Polystyrene may equal last year's figure

Anticipated domestic production of benzol in 1951 may reach 230 million gal.; imports are now running between 3 and 5 million gal. a month or between 40,000,000 and 50,000,000 gal. a year.

The above 86 million gal. of benzol would make 700 million lb. of styrene, but it is doubtful that all the new styrene capacity counted on for 1951 will come in. Something like 650 million lb. of styrene is more realistic. Rubber will require only 330 million pounds. Note that figure carefully—it is lower than most commonly used figures because the government has reduced styrene requirements in GR-S by some 35 to 40 million lb. due to reduced content of styrene per ton of rubber.

Uses for styrene other than molding powder are

estimated to require between 70 and 80 million lb. in 1951. These combined uses, rubber and other, then equal a maximum of 410 million lb., which would leave 240 million lb. for styrene molding materials. In other words, the polystyrene industry will have 240 or 250 million lb. in 1951, if present trends carry through, in comparison to about 260 million lb. in 1950. Scores of things can happen to change that estimate but that's the way it looks today.

Scrap Order in Abeyance

A significant recent development is that OPS is holding their proposed scrap pricing order in abeyance. The upward trend of scrap prices is reversing. Polyethylene scrap alone declined 10¢ per lb. the first two weeks in March and has been on the decline ever since. Vinyl scrap is not too far above normal, is the report. Polystyrene scrap is still around 60¢, but at least not rising.

If the market for scrap should show a sudden increase again, OPS is now ready to clamp on a regulation quickly, but they won't move until that time comes. The order was prepared more at the behest of scrap dealers themselves than anyone else—they brought in evidence to show that some processors apparently had excessive stocks of scrap which were finding a market at higher prices than virgin material. Those complaints have now ceased.

No special price regulation as yet

There is presently no indication that a special price regulation will be written for plastics raw materials. Producers whose prices were frozen at the base period will now be governed by the new General Manufacturers' Price Regulation that affects all industry and may possibly permit some upward adjustments, but no great rise is anticipated. Plastics suppliers operated under the General Maximum Price Regulations in the last war, and have given no indication that they want a separate regulation now.

The Consumer Durable Goods Section of OPS will handle fabricated plastics products pricing except for vinyl film and sheet, according to a new ruling. Carl Kresl in Room 2204, Tempo Building S, is in charge.

Vinyl sheet and all plastics raw material pricing activities will continue to be handled by W. L. Bossart of the Chemicals Div. of OPS. He is a former associate of Irving R. Boody & Co., chemical importer and exporter.

Use of Castor Oil in Plastics Slashed

The plastics industry can now have only 30% of the castor oil used in late 1950, according to the Department of Agriculture's Defense Order DFO-1, effective last April 4. Although castor oil is used as a plasticizer for cellulose nitrate and ethyl cellulose, its primary function in plastics is as a principal raw material used in the production of sebacic acid.

Sebacic acid is used in the production of sebacate plasticizers and nylon plastics. Sebacate plasticizers are used to impart low temperature flexibility to vinyls, especially for electrical insulation. But the plastics industry had already become reconciled to loss of sebacate plasticizer for civilian goods—it has been going almost 100% to DO orders for some time.

Nylon used for brushes, gears, and wire coating is the type that generally requires sebacic acid. The Signal Corps' wire program may be affected by lack of enough sebacic acid to make the proper nylon formulation. Chief factor in the scarcity of sebacic acid is that it is needed in the defense program for explosives and aircraft lubricants.

The Famous or Infamous DO 97

No order so far issued by the National Defense Administration created more criticism or ridicule than Regulation 4 of the Maintenance Repair and Operating Supplies order. Supposedly issued for the benefit of the little fellow, Regulation 4 permitted practically anyone to issue his own DO 97 for acquirement of anything he needed that might be termed an operating supply. One man issued a DO for a few dollars worth of ice cream cones; another wanted alcohol to put in shampoo for his beauty parlor; grocers used DO's to obtain paper sacks. Polyethylene, acetate film, and cellophane were particularly hard hit by the order because of their use as packaging materials.

Just as we go to press the Regulation has been amended so that no more DO 97's will be issued for chemicals; paint, varnish, and lacquers; packaging materials including containers, wrappers, and paper.

Molding powder exempt from DO 97?

NPA will be busy for weeks to come making interpretations of what will be affected by the new amendment. The interpretation of "chemicals" is vital to plastics—they are now defined as "all basic organic and inorganic chemicals, their derivatives, and intermediates other than compounded end products not customarily sold as chemicals." Thus it is intended that a plastic molding compound should be interpreted as a chemical and *not* subject to a DO 97 order. Film or sheet is exempt if used for packaging, but *not* exempt if it is used for some other type of operating supply.

It will be up to the administrator of the MRO order to determine such important points as whether or not a DO 97 can be extended to obtain raw materials—thus a manufacturer of plastic pipe may be served a DO 97 by a user who claims it as an operating item, but there is currently no authority for that manufacturer to extend the DO to his supplier for plastics raw material to replenish his inventory. Regulation 4 has been improved, but it is by no means a clear cut order as yet.

MODERN PLASTICS

VOLUME 28 MAY 1951 NUMBER 9

Phenolic-Improved Wood

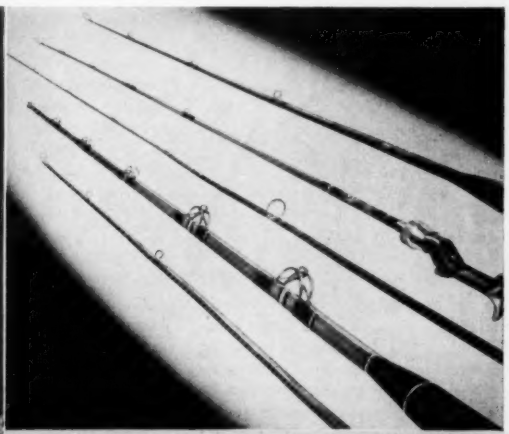
A number of grades of densified wood are being widely used in decorative, household, and industrial applications

GROWING steadily in importance because of the beauty and the unusual properties of the finished product is the combination of wood and phenolic resin known as densified wood. In materials of this type, the resin is cured after the introduction of the resin into the structure of the wood, giving it an entirely new range of properties.

Densified wood falls into two general classifications. *Impreg* is the generic name for phenol-resin treated wood in which the resin has been cured without the application of pressure. This material was first used for electrical control equipment housings and as a facing for redwood decking on aircraft carriers during World War II. *Compreg*, similar to impreg except that it is subjected to both heat and pressure during the production process, has been employed in such military items as aircraft propellers, antenna masts, and spar and connector plates.

Much of the preliminary research and development work on modified woods in this country was carried out at the U. S. Dept. of Agriculture Forest Products Laboratories, Madison, Wis., under the direction of Dr. Alfred J. Stamm, Chief, Div. of Derived Products. At present, the compreg-type material is being made on a commercial basis by several companies in the U. S., ready for fabrication into finished consumer or industrial items.

There are a number of reasons for the growing popularity of com-



Photos courtesy Bakelite

Densified wood serves many and diverse purposes when suitably laminated. Above: Fishing rods made of wood-resin material have good flexibility, gain required directional strength by arranging plies with grains parallel. Left: Compreg-type draw die punch for plane nacelle obtains rigidity from cross grain laminations providing uniform strength in all directions

Photos courtesy The Formica Co.

Initial step in the manufacture of compreg type densified wood is to produce thin sheets of wood veneer from selected logs

In the vacuum impregnation process, veneer is placed in pressure chamber and resin is admitted after air has been removed

preg. It may be 10 to 20 times as hard as natural wood, with vastly greater abrasion resistance. It also has greater electrical resistance than natural wood and is less subject to decay or attack by termites and marine borers. The strength properties of compreg, except for toughness and Izod impact, are increased in proportion to the increase in specific gravity, being little affected by manufacturing variables and degree of cure.

In producing compreg, the phenolic-treated wood is compressed to a specific gravity of from 1.3 to 1.4 while the resin is being cured within its structure. A water-soluble phenol-formaldehyde resinoid material constitutes the impregnating agent. Highly resistant to water, chemical attack, scuffing, and temperature extremes, compreg can be machined without losing its beautiful finish; surface gloss is easily restored by buffing after machining.

Compreg may be tailored to end use requirements by varying the grain direction of the layers making up the finished piece. A fishing rod, for example, is produced with parallel laminations for directional strength, while a forming die is made with cross grain laminations to give uniform strength in all directions.

Modified woods of this type can be machined with regular wood working equipment, such as high speed steel cutters and saws. For volume fabricating, manufacturers recommend carbide tipped tools for greater economy, depending upon operating conditions and production requirements. These materials may be tapped, bored, threaded, tapered, grooved, and faced without difficulty. Finishing to final dimensions may be effectively handled by belt or disk sanding.

Sections thicker than 2 in. can be built up by cementing two or more pieces together with a heat reactive resorcinol-type resin. If the design of the tool or part will permit, such built-up sections can be joined with machine screws or studs.

Even species of wood which are normally inferior will make good compreg. The only types not satisfactory are resinous woods and those which, like oak, are difficult to treat. Principal steps in the production of densified wood include impregnation with the resin, conditioning to insure complete diffusion of the resin into the cell walls, and, finally, the simultaneous application of heat and pressure, which causes the resin to polymerize within the structure of the wood.

Impregnating Methods

Since impregnating thick sections is a slow and rather uncertain process, the most practical method is to impregnate veneers or plies which are later combined into the finished product. In the *spreading* method of impregnating, suitable only for thin veneers, the undiluted resin is applied to the veneers as a surface coating by a conventional glue spreader, and forced into the wood during subsequent compression. In the *total immersion* process, which is more widely used, the wood veneers are totally immersed in a water solution of the resin diluted to approximately 30% solids content.

Immersion can be carried on in an open tank at atmospheric pressure, but this is time-consuming. Impregnating time can be greatly reduced by using an autoclave or pressure chamber. In this method, the wood is placed in the empty

chamber and the air is evacuated. At the end of the vacuum period, diluted resin is admitted to the chamber to cover the wood, and pressure of 50 to 60 p.s.i. is immediately developed within the chamber to assist in thorough impregnation of the wood.

If hardness and high density are the only requirements of the finished material the wood or veneers can then be dried to a low volatile content and cured without further conditioning. For maximum dimensional stability, however, the treated wood must first undergo further conditioning to permit complete resin diffusion into the cell walls. This is done by maintaining the high moisture content of the wood for from one to three days by dead piling the veneers and covering them with a waterproof tarpaulin, or by dead piling the stock in a room maintained at 80 to 100% humidity.

After treating and conditioning, the veneers are ready for the compression process to produce densified wood. The degree of cure to which a panel is subjected affects its water resistance, impact strength, and flexural strength. Optimum curing time for average requirements, according to Bakelite Co., is 30 min. after the center of the panel reaches 270° F., while optimum platen temperature is between 270 and 300° F.

On this basis, the average cycle on a ½-in. densified wood panel would be between 45 and 60 minutes. Approximately half the cycle is required for the panel to reach curing temperature. Some increase in flexural and impact strength can be obtained by slightly undercuring, while dimensional stability is increased slightly by overcuring.

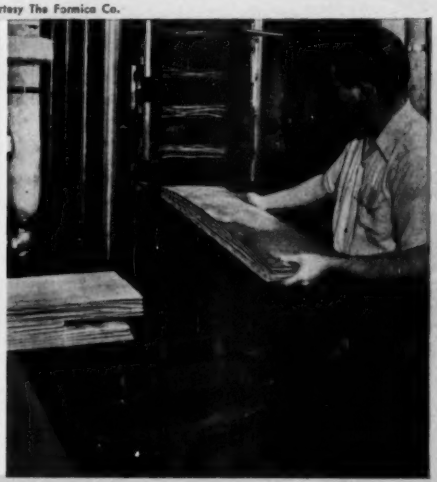
Parkwood Corp., Wakefield, Mass., is a producer of densified wood under the trade-name Hi-Den. The company reports that the largest current markets for this type material are knife and other handles, picker sticks and other textile machinery parts, and dies and other forming tools. A number of manufacturers are now employing Hi-Den for such items as die stock, forming tools, fixtures, musical instruments, electrical transformer parts, strain insulators, conveyor system components, and internal supports for television antennas.

Parkwood Corp. uses birch veneers in the manufacture of Hi-Den. The material is available in

When the phenolic resin-impregnated veneer is removed from the pressure chamber, stacks of the sheets are wheeled into a large oven for drying

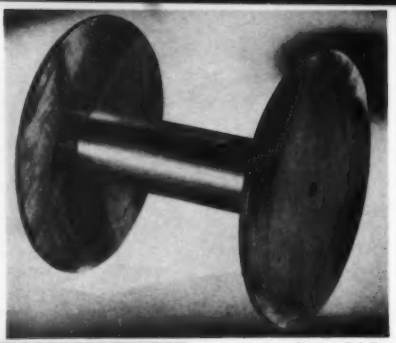
Enough sheets to make required finished thickness are compressed in multi-platen press and cured under heat

Photos this page courtesy The Formica Co.



Laminated modified wood as it emerges from curing press. The boards are of uniform thickness and good quality; final finishing consists simply of sawing off resin flash

Spool ends made of densified wood, one of several successful uses of this material in textile field, are easily machined to a smooth surface, have long service life, cost less to make than ends produced from formerly used material



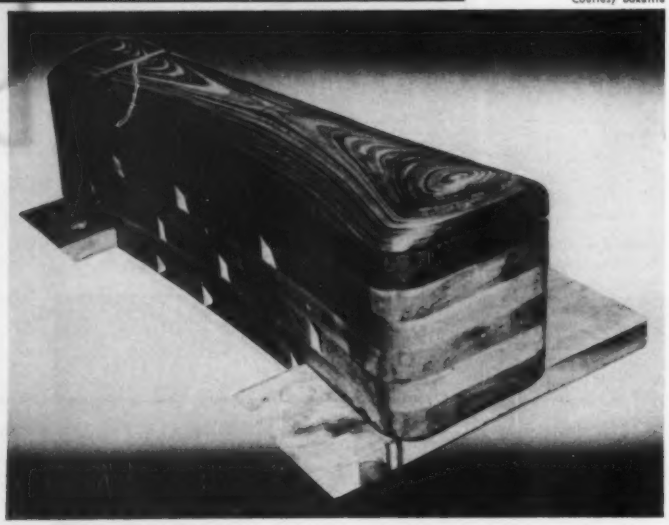
Courtesy The Formica Co.

Courtesy Bakelite

Beauty and moisture resistance of compreg make it adaptable to a variety of products including compacts, brush backs, shaving brush handles. Hardness and toughness make it particularly suitable for golf club heads

Below: Smooth, hard surface of compreg used in wing fillet punch protects metal against stretching, reduces number of rejects, facilitates deep draws. Making tool of densified wood permitted 10% saving in production costs

Courtesy Bakelite



several stock grades of both cross and parallel plies, to meet specific end-use requirements; it also can be made up in special grades where necessary. Hi-Den has a specific gravity of 1.30. Tensile strength ranges from 15,000 p.s.i. to a maximum of 40,000 p.s.i. Modulus of rupture ranges from 20,000 to 46,000 p.s.i. Izod impact value for Hi-Den, in foot pounds per inch of notch, varies from 3 to 8.5. Moisture absorption in 24 hr. ranges from 2 to 6 percent.

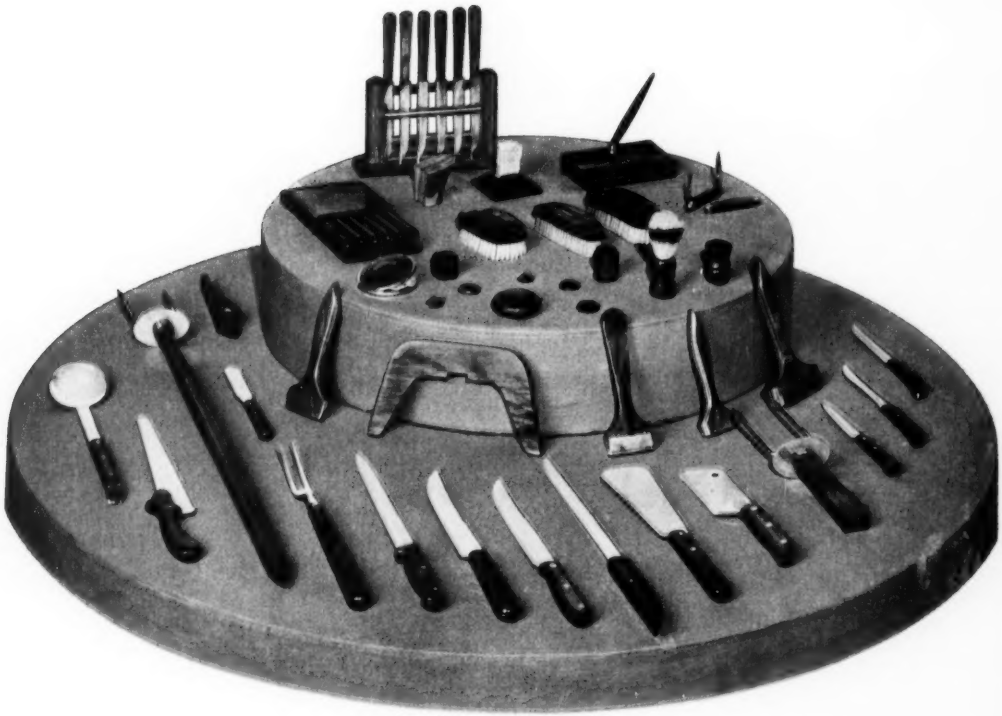
Two Compreg Types

Another leading supplier of the compreg type densified wood is The Formica Co., Cincinnati, Ohio, which manufactures the product in two basic types. Formica Age Proof Wood, outstanding for beauty and moisture resistance, is intended mainly for functional applications where appearance and low moisture absorption are primary considerations. Pregwood 1100 is designed essentially for industrial applications where great mechanical strength requirements predominate.

Production of Pregwood and Formica involves cutting veneers from selected logs and vacuum impregnation of the veneers with phenolic resin. The veneers are then oven dried before being placed in multiplaten presses for curing into finished pieces. In the process, the material is compressed to about 50% of its original thickness. When removed from the press, the laminated Formica or Pregwood is of uniform thickness and quality all the way to the edges; the only finishing operation required is to saw off the resin flash at the ends of the pieces.

Torture Test

Dramatically highlighting the value of Formica for kitchen utensil handles used around hot, greasy water is a torture test devised by Formica engineers. In this test, samples of Formica are immersed in boiling water for 6 hrs., simulating in that short period of time the wear and tear that cutlery handles would normally receive over a period of many years. Samples emerged from the test without loss of color or luster, showing no sign of chipping, cracking, or warping. The surface remained hard and smooth, offering no opportunity for grease absorption.



Color plates courtesy The Formica Co.

Wide diversity of existing applications for modified wood is illustrated by this display of consumer products, all made by Adams Plastics Co., Inc. Items made from this material range from buttons, through cutlery and brush handles, to varying types of racks

A major user of densified wood is Adams Plastics Co., Inc., Holyoke, Mass., which fabricates it into handles for the cutlery industry. The Adams compreg handles, used by a number of leading cutlery firms, are identified by the company as Pakkawood.

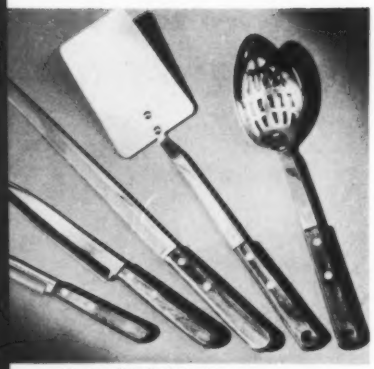
Farlite Compreg, produced by the Plastics Div. of Farley & Loetscher Mfg. Co., Dubuque, Iowa, in recent years has been confined essentially to two grades. Grade 1808-M, notable for its high impact strength, is parallel laminated and comes in thicknesses ranging from $\frac{3}{4}$ to 2 inches. It is used principally for insulation blocks or spacers, propeller blade blanks, and picker sticks used in the textile field. Grade 1716-B, consisting of cross laminated hardwood veneers, is used principally for knife handles, brush backs, lamp bases, and other decorative applications where the veneers can be tapered to take advantage of the beauty of the laminated structure. Pieces are then polished to a high gloss.

The beauty and permanence of densified wood form an ideal combination in such consumer products as military and clothes brush backs, fountain pen bases, compacts, knife and utensil handles, knife holders, silent butlers, etc. The hardness of the material, along with toughness, low moisture absorption, and enduring finish, makes it ideally suited for golf club heads. Fishing rods of densified wood, in addition to their handsome appearance, possess the desired flexibility, are virtually impervious to water and weather, and are exceptionally strong, having a tensile strength of 30,000 p.s.i. and flexural strength of 40,000 p.si.

Uses in Industry

The industrial applications for densified wood are legion, and are increasing steadily as the properties of these materials become more widely recognized. For example, picker sticks of the compreg type material are now supplanting those made of conventional wood in the textile industry because of their superior stiffness and strength. In service, the sticks are subject to continuous abrasion. Actual tests have shown that 600 sticks fabricated of densified wood can outlast 12,000 made of conventional wood, with a 56% cost saving.

Foundries make use of densified wood for pattern boards because the material has a long service life, and its smooth surface releases the sand quickly. The rubber industry has found that rubber extrusion turntables made of compreg are sufficiently light to be handled easily by the operator, while their smooth surfaces greatly reduce production rejects. Turntables made of conventional wood often splinter,



Courtesy Ekco Products, Inc.

Kitchenware handles made of compreg resist chipping, cracking, warping

Courtesy Stevens-Hepner Co., Ltd.

Smartness and utility are combined in hair brush backs made of phenolic-improved wood

and the splinters tear the rubber.

Spinning chucks machined from densified wood provide important economies in the spinning of aluminum parts. Their production cost is approximately one-sixth that of similar forming dies constructed of metal. In addition, their low coefficient of friction prevents overheating of the metal being worked, while their smooth surface protects the parts against scratching.

The aircraft industry, in particular, is making wide use of densified wood in the construction of dies and forming tools. By adopting this material in constructing a large draw die punch measuring 62 by 42 by 16 in., one aircraft manufacturer effected a 10% reduction in tool costs. Another aircraft tool—a punch used in forming a large nacelle section—illustrates the ease with which tools may be modified at low cost. After a design change was made in the contour of this punch, one section was raised by the addition of a compreg patch. In still another case, a compreg wing fillet punch was fabricated at a cost 10% lower than its predecessor.

In aircraft draw die sets, it has been found that use of densified wood reduces the number of formed parts that are split or torn in the corners. A frequent practice is to fabricate the working surfaces of the die from compreg, with intervening portions of composition board or other material.

A special type of densified wood is manufactured for the company's own use by Apparatus Dept., Switch Gear Divs., General Electric Co., Philadelphia, Pa. This material, produced in panel and rod form, is used in circuit breakers and other switch gear products.

Dies Easily Altered

At its Buffalo, N.Y., plant, Twin Coach Co. has made extensive use of densified wood dies to obtain increased production of improved quality parts. Such dies, the company points out, can be quickly and easily made and altered, while their high strength prolongs service life. The low coefficient of friction minimizes scratching of the metal being formed, and produces an even distribution of metal in the drawn parts. According to the company's tool superintendent, a minimum production of about 200 parts is usually required to warrant the use of densified wood tooling. Depth of draw can generally be increased as much as 50% by replacing steel dies with densified wood dies, according to this tool expert.

One interesting and difficult job accomplished by Twin Coach with Hi-Den tooling involved the forming of a part 8 in. wide and 84 in. long, drawn to a depth of 5 in. from 0.051-in. aluminum alloy. Using a 750-ton hydraulic press, more than 5000 parts were produced at a rate of 50 per hour without requiring die maintenance or replacement.

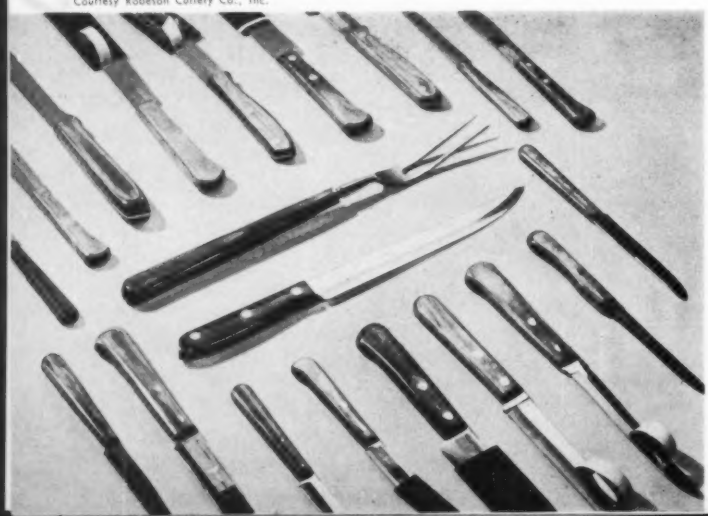
The punch used on this job was built up of layers of densified wood to a thickness of 3 in., backed up by strips of birchwood. Steel sheets were provided on the ends of the punch to facilitate slipping the drawn part from the punch.

Twin Coach officials have estimated the actual cost of a densified wood die, including material and fabrication, as approximately one-third that of a comparable steel die. Maintenance costs are also lower, and less scrap is produced.

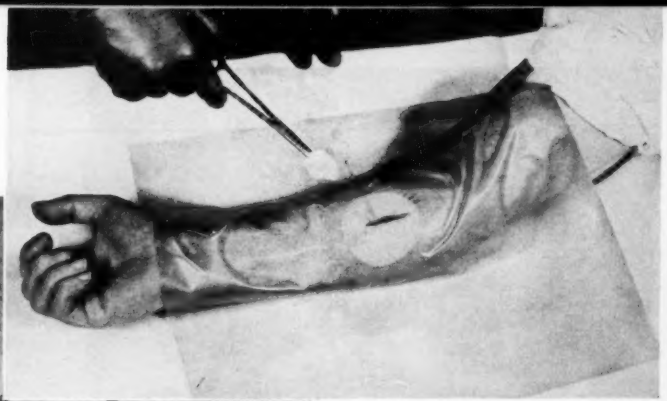
For supplying information helpful in the preparation of this article, MODERN PLASTICS *wishes to acknowledge the cooperation of the following companies: Adams Plastics Co., Inc.; Bakelite Co.; Chemical Div., The Borden Co.; Durez Plastics & Chemicals, Inc.; Plastics Div., Farley & Loetscher Mfg. Co.; The Formica Co.; Chemical Dept., General Electric Co.; Parkwood Corp.*

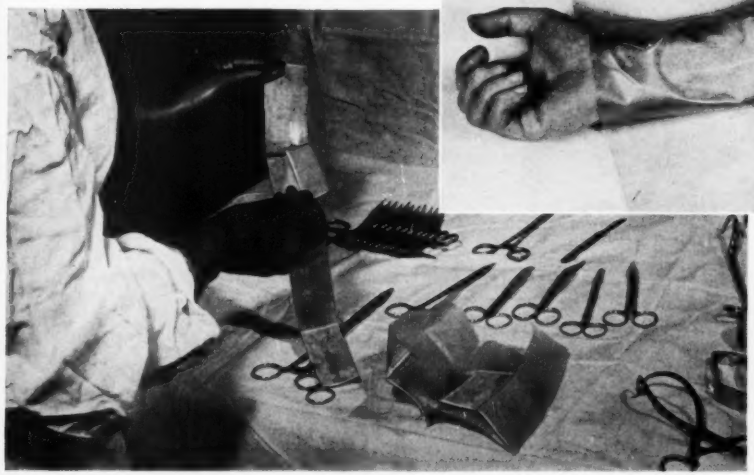
In end uses requiring low moisture absorption and resistance to abuse, resin-wood laminates prove their value. Items shown on this page use modified wood by Formica

Courtesy Robeson Cutlery Co., Inc.



Below: After removing vinyl surgical drape from protective glassine inner wrap (right) nurse removes liner which covers pressure-sensitive adhesive. Strip eliminates clipping needed to keep towel drape close to skin





Photos courtesy Minnesota Mining & Mfg. Co.

Above: Treatment-type drape shows how incision can be made in plastic. Adhesive, which conforms to irregular areas, forms impenetrable barrier protecting wound from any contamination by exposed parts of body

Vinyl Surgical Drapes

A HUGE potential market—both civilian and military—for vinyl film is seen in the field of vinyl surgical drapes. These drapes, recently introduced to surgeons by Minnesota Mining & Mfg. Co., St. Paul, Minn., are pre-sterilized, moisture-proof, and have pressure-sensitive adhesive areas. They provide the surgeon with ready-to-use drapes of assured sterility for office, emergency ward, clinic, hospital, and field use. It is expected that these vinyl drapes will prove of particular value in military field hospitals where the time factor is always important and where sterilization facilities are often inadequate.

Surgical drapes are used to isolate and demarcate the operative site from all surrounding parts of the body and to minimize danger of contamination or infection. The most common drapes now in use are towels, which must be cut to fit the operative site, and sterilized in the operating room just prior to use.

Made of soft but tough vinyl film, each of the new drapes is pre-packaged in two glassine inner wraps and heat-sealed in a foil-and-vinyl-film laminate outer package. It is then sterilized by subjecting the sealed package to not less than 250° F. in a steam autoclave for 40 min., according to standard U.S.P. procedures for surgical sterilization. In this manner the drape is sterilized after the handling and packaging operation and remains sterile until it is unwrapped.

The moisture-proof properties of the vinyl drape help to insure a sterile operative field. The upper surface of a drape must remain dry throughout the operation to maintain this sterile field. Perspiration of the patient often seeps through a towel drape from the underside; the waterproofness of the vinyl drape eliminates this source of contamination.

The drapes are held in place by the pressure-sensitive adhesive strip which, until used, is protected by a liner. When this liner is removed, the strip will adhere to the skin on contact, forming an impenetrable barrier to contamination which also conforms to irregular areas of the body. The adhesive eliminates the clipping (or even sewing) which is necessary to keep a towel drape close to the skin.

In addition, the vinyl drape offers other advantages over ordinary sterile toweling. It is unaffected by surgical solvents and detergents. Incisions may readily be extended through the plastic sheet if desired.

In some procedures, such as abdominal operations, the non-toxic, inert drape may be tucked into the body opening to extend the sterile area. In extensive tests, no evidence of skin or wound edge irritation has been reported in a single patient.

The drapes, called "Scotch" Brand Surgical Drapes, are the result of an idea conceived by three Cleveland surgeons—Drs. T. S. Gerspacher, H. D. Fowler, Jr., and D. E. Rolf, of the Euclid Clinic—who found themselves handicapped by the lack of sterilization facilities during field service in World War II. Three years of research work carried on by these surgeons in conjunction with Minnesota Mining & Mfg. Co. resulted in the development of the pre-packaged and pre-sterilized vinyl drape.

BUTYRATE

Photos courtesy Tennessee Eastman Co.

Unbreakable cellulose acetate butyrate handle and knob of plane (right) replaced wood components (left). Handle is molded in one piece, knob in two parts

EVERYONE who uses hand tools has noticed a gradual change in the design of such tools since the end of World War II. The most obvious feature of the change has been the use of handles made of plastics instead of wood, metal, or hard rubber. One of the best examples of this trend is the line of tools made by Millers Falls Co., Greenfield, Mass.

Millers Falls, which has been manufacturing tools since 1868, was one of the pioneers in the use of plastics for the handles of such tools as drills, braces, and planes. These handles are molded of Tennessee Eastman's Tenite II cellulose acetate butyrate by F. J. Kirk Molding Co., Clinton, Mass.

Hollow Drill Handle

Despite public acceptance of plastics in screw driver and chisel handles, Millers Falls expected buyer resistance when it began to use plastics in other tools. The first such item which the company brought

Drill, redesigned with plastic handle and knob, has added durability and sales appeal

Salesmen use sample drill handle—distorted but unbroken after test—to demonstate toughness of plastic material

HANDLES — Better Tools

out was its No. 104 hand drill, a redesigned version of the No. 5 hand drill. This drill had a hollow screw cap wooden handle in which extra drill points are stored. In addition to changing the handles, the company completely redesigned the tool itself, improving the chuck, the gears, and other metal parts.

The company knew that the hollow butyrate handle would be far stronger than a hollow wooden handle, but it also knew that the hardware trade did not know much about the properties of plastics. The trade had learned to trust the solid handles used on screw drivers—but a hollow plastic handle was another thing.

As the company expected, tool buyers were reluctant to try the No. 104 drill. Many salesmen reported that their customers flatly refused to consider the item. It was obviously necessary to prove the durability of butyrate to the buyers.

Millers Falls then took a sample handle and squeezed it in a heavy vise until it was completely collapsed. The distorted, but unbroken, sample was a vivid proof of the toughness of the Tenite handle. The company prepared one such tortured sample for each of its salesmen and orders began to come in.

One of the company's salesmen hit on another method of demonstrating the Tenite handle's durability. He simply held the drill by the chuck and dropped it on a concrete floor so that it hit squarely on the end handle. The drill bounced high enough so that the salesman could catch it and pass it over to the buyer for inspection. The undamaged handle usually made the sale.

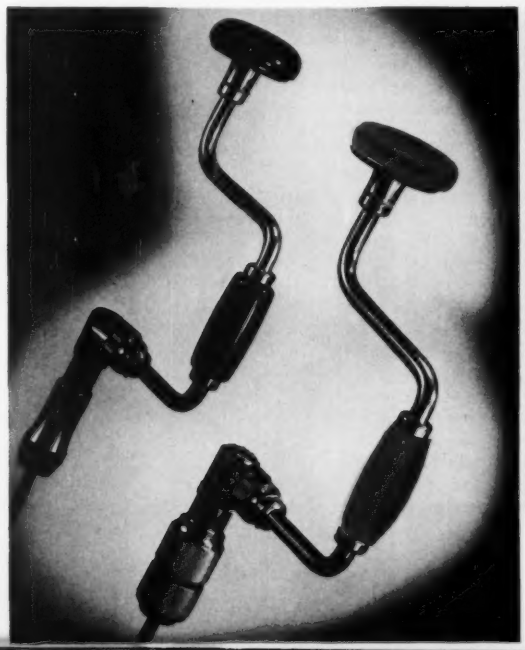
Brace, Plane, Hack Saw

The Tenite-handled No. 5010 brace, a redesigned version of the company's No. 32 wood-handled brace, did not meet the buyer resistance encountered by the hand drill. The company ascribes this to the fact that there were no thin sections in the brace handle, as well as to the acceptance of plastics resulting from the success of the hand drill.

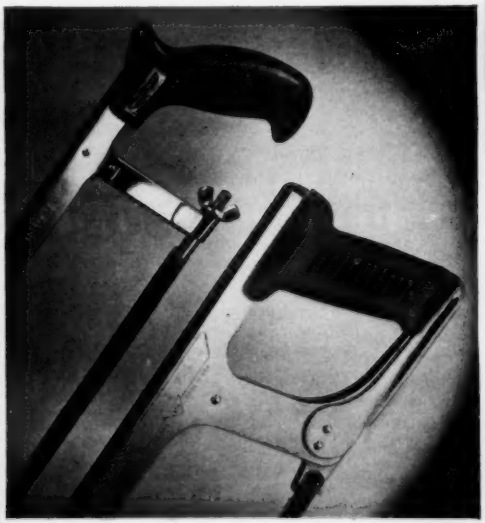
By the time the company offered its Tenite-handled No. 714 plane, buyers had had a favorable reaction to the two previous items and had begun to consider plastic handles as a distinct asset. The No. 300 hack saw frame was also accepted without question by the trade.

The complete success of butyrate handles is proved by the following statement by Millers Falls: "We are very well pleased with our experience with Tenite handles and shall continue to use them, not only on the tools that we have already equipped with them, but any new tools that we bring out where it is feasible to do so. They are colorful, with a pleasing finish or feel, and they are warm to the touch. And, of course, their durability is one of the largest factors in our enthusiasm for them We unhesitatingly guarantee all of these Tenite handles unbreakable in use."

Absence of thin sections aided acceptance of butyrate brace handles. Slow molding cycle at low temperature solved molding problems in round head



Molded-on butyrate "pistol-grip" handle (right) for hacksaw adds strength to frame; handle can withstand severe twisting stresses



The Promise of REINFORCED PLASTICS in Defense

PART 3

Courtesy Bureau of Ships, U. S. Navy

Navy landing craft 36 ft. long is molded in one piece of reinforced plastic. Five such LCVP's are now under test, and a large scale production program is under consideration

IN THE previous two articles in this series we outlined the types of resins and fibrous glass reinforcement now available, we drew general conclusions regarding the military potentialities of these materials, we showed the important part that Armed Forces development agencies have played in the evolution of new applications, and we presented evidence of the importance of peacetime molding and fabrication techniques to quantity production of military items.

THE whole matter of "sandwich" construction is cogent to the molding of large glass reinforced polyester pieces. Honeycombs (to be discussed in detail next month) and foams (see MODERN PLASTICS Oct. 1950, p. 83), as well as balsa wood, are used as core materials with reinforced plastics skins, the selection of core material depending upon the requirements of the application.

In the radome field there has been a constant struggle to maintain economy and speed of production in tailored honeycomb use along with an improvement in electronic transparency. The latter problem has yet to be completely solved; the reject rate on radomes because of electronic irregularities due to lack of uniformity in structure is very high, and of those radomes which are accepted it is reported that comparatively few are electronically perfect. There is an increasing interest, therefore, in improvement of sandwich techniques and in foaming plastics in situ to obtain balanced and uniform radio transparency.

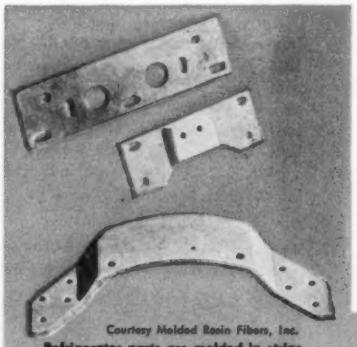
More will be heard in the next few months about foams as flotation materials in the construction of reinforced plastics boats. The Navy's 36 ft. LCVP, for example, contains huge quantities of foam molded-in the hull.

Helicopter Blades

A good example of the creation of a molded unit with an integral core—in this case balsa wood—is the experimental helicopter blade developed by the U.S.A.F. Air Materiel Command and the Cornell Aeronautical Laboratory, Buffalo, N.Y. Tests have proved that the unit is aerodynamically and structurally superior to most conventional types of rotor blades. The new blades are 24 ft. long with an average width of 20 in. and represent the largest metal-to-metal molding job in the field.

First, the core is shaped from balsa wood with a hardwood nose containing a lead balance weight. Then comes the wrapping procedure wherein Fiberglas cloth of different kinds, presaturated with resin, is laid up over the core preparatory to molding.

The molds, 25 ft. long and 25 in. wide at their widest point, are cast of Kirksite metal backed with concrete, copper tubes being laid against the back face of the mold cavity. Each half of the die is cast in 5 ft. sections. After the blade has been wrapped and placed in the mold, mold temperature is stabilized at 120° F., and pressure is applied by clamping the two halves together by means of tie-down bolts embedded in the floor on each side of the mold. Approximately 70 p.s.i.



Courtesy Molded Resin Fibers, Inc.

Refrigerator parts are molded in strips or channels, then rapidly punched out

Polyester and glass cloth aircraft fin tip has wire mesh antenna molded-in

Courtesy Zenith Plastics Co.

of molding pressure is obtainable.

The new blades, by virtue of their sandwich type construction, have a rigid cross-section which is not deformed by structural loads or aerodynamic forces applied to it in flight.

Electrical Grade Materials

A big development of the past couple of years is in electrical grade glass-polyester materials for compression molding purposes. First move in this direction was made by Laminated Plastics, Inc., Cleveland, Ohio, as a secondary result to its creation of sheet Glastic, a laminated glass-polyester dielectric material.

The aim of the company originally was to produce, first, an electrical grade material competitive in price with cotton-phenolic laminates, but superior in electrical and physical properties, and, second, a material that could be used in some applications in place of melamine-glass laminates at lower cost. The Glastic sheet materials have invaded the heavy duty electrical field because of improved heat resistance, arc resistance, impact and tensile strength, low water absorption, punchability, and low cost.

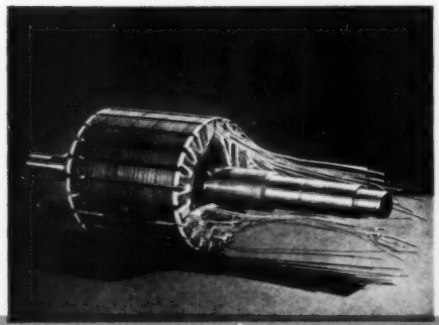
Following this lead, conventional high pressure laminators as well as other low pressure laminators have moved into the field.

Following these laminates also came the development of the dielectric grade molding material made of irregularly chopped glass fibers and polyesters. Today, Laminated Plastics, Inc.; Molded Resin Fiber Co., Ashtabula, Ohio; Kurz-Kasch, Inc., Dayton, Ohio; and Universal Moulded Products Corp., Bristol, Va., all produce and use their own polyester-glass molding materials. They do not sell these materials to other molders but custom mold them for the electrical and chemical industries.

Main purpose of this new material is to improve impact strength while providing as high heat resistance, moisture resistance, dielectric strength, arc and chemical resistance, and dimensional stability as do the conventional electrical grade laminates.

A basic advantage of these molding materials is that there is no limit to the thickness of a wall section that can be economically produced, simply because the catalyst in the resin provides exothermic heat to do the job. A section 2 in. thick, for example, may be molded in 4 or 5 minutes. Another advantage is that molding pressures may be low. A third advantage is the low cost of the finished moldings. Fourth advantage is in applications where full use may be made of the electrical and chemical properties of the materials. Fifth is the fact that they can be molded to intricate shapes with variable cross-sections.

A case in point is where Glastic



Photos above and below courtesy Reliance Electric & Engineering Co.

Reinforced polyester laminate material is being used in end laminations of electric motors. The plastic sheets have low water absorption, high heat- and arc-resistance; are strong and can be die-stamped to shape

Courtesy U.S.A.F. Air Material Command

Experimental rotor blades shown on Bell helicopter (above) have balsa wood cores and laminated fibrous glass surfaces. Mold for rotor blade (below) has cavity 25 ft. long, varies in chord from 25 in. at root of blade to 15 in. at tip. Tension bolts anchored in floor are used to apply pressure to steel beams on upper half of mold

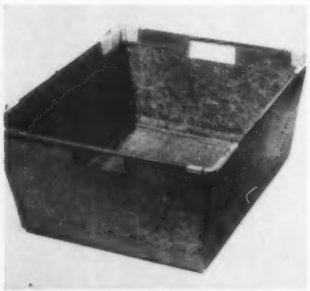
Courtesy Cornell Aeronautical Laboratory

Courtesy Corrulux Corp.

Shatter-proof glass mat-polyester panels, corrugated to match steel and asbestos materials, are used to daylight barracks and other buildings

Courtesy Laminated Plastics, Inc.

Brush studs with metal insert for Reliance electric motors are one-piece molded of polyester-glass "putty" molding material



Courtesy Waterbury Companies, Inc.

Light weight carrying box for Army has steel strengthening frame molded-in

molding material took over from an asbestos-cement molding mixture in armature brush holder studs. The former material absorbed moisture and caused current leakage, and because it was soft was easily damaged. Parts molded of the glass-polyester combination have been in operation since 1947 without a single instance of failure. Furthermore, the finished pieces are 35% cheaper than the former ones.

What is proving up in the heavy duty electrical industry will undoubtedly prove up in electrical components for battleships, aircraft, and field units although direct flame resistance of these materials is reported as not equal to that of glass-filled melamine. There may be military significance in the possibility of the increased use of polyester-based molding material for civilian applications to release more of the fireproof materials for direct military use.

Skylights

Another development of military importance in this field—and one which received its main impetus from the civilian market—is the corrugated translucent partition panels developed by Corrulux Corp., Houston, Texas, and Allied Synthetics Co., San Diego, Calif. These panels (see MODERN PLASTICS April, 1951, p. 87) are made to match standard corrugated metal and asbestos building skin sheets and may be sawed, nailed, and riveted or bolted to form skylights and partitions in either Quonset-type or standard pitched roof buildings. Because of their light weight, their weatherability, their ease and speed of handling on the job, they have already become materials for military construction.

Trays and Boxes

One of the better known and most profitable applications of reinforced plastics wherein glass mat is used with polyesters in compression molding is in the tray and tote box field. This is one spot where preforms could not be made to do the job and where strength of plastic and glass reinforcement alone was not always sufficient for the purpose; metal reinforcement had to be built in.

There are two basic approaches to the problem of metal reinforcement: that used in the Vidal process whereby metal bands are molded into the piece in a metal female, flexible male mold, and that used by Molded Resin Fiber Co., and others, wherein formed welded steel rods become the reinforcement, molding being done in metal molds with hardened cut-offs and pressure being put on the resin. Literally millions of tote boxes and trays have been produced by this industry during the past three years, single orders running as high as 600,000 units. This field will remain a big outlet for glass mat, with trays and tote boxes becoming better and better products as development continues.

Inserts are Easy

Regardless of the size of the molding or method of producing it, reinforced plastics pieces will accept inserts of all kinds probably more satisfactorily than almost any other plastics materials. As was pointed out in the first article of this series, the fact that these resins neither shrink nor expand appreciably under cure permits them to be used for insert work. From molded electrical parts containing copper sections, as produced by Laminated Plastics, Inc., to huge airplane stabilizer fins produced by Zenith Plastics Co., Gardena, Calif., and containing molded-in antennas, there is a whole range of products in which this principle of insert application to reinforced plastics has been well used.

An excellent example of this insert principle is a land mine detector head molded by Laminated Plastics, Inc. This is a combination of glass fabric and mat molding in a compression press with copper grid and wire connection inserts actually "potted" into the low pressure molding. The fact that mold pressures can be very low means that the most delicate inserts can be used. In this job, absolute dimensional stability was imperative.

Adhesives and Coatings

Still another advantage of these materials in whatever form they are used, is their acceptance of adhesives and coatings. Because of their ability to be glued with similarly constituted polyesters, the gasoline pipelines mentioned in our April article can be assembled in the field

using the slip-fit principle with air-setting adhesives. Because of this acceptability of adhesives, the Apex washing machine liner (see MODERN PLASTICS April 1950, p. 93) is literally glued to an aluminum spindle core. Because of the coatability of glass-reinforced polyester moldings a major problem in radome application is well on the way to being overcome; these materials as presently made will not stand up to rain erosion, and coatings are now applied to give them this protection.

Books have been written and more books are yet to be written on one or more phases of reinforced plastics. Hundreds of magazine articles already written will be followed by thousands more. In this series of three articles we have not attempted to record detail which is obtainable elsewhere; we have tried only to outline the scope of fibrous glass polyester plastics as they stand today and as these materials can be expected to contribute to the mobilization program.

Probably no other plastics materials are being studied with such intense and pragmatic interest by military development and procurement officials. Certainly, no other plastics are receiving similarly excited attention from old-line compression and injection molders and high pressure laminators. The S.P.I. Reinforced Plastics Conference in Chicago at the end of February proved this point.

Where reinforced plastics go from here in the mobilization program and in civilian use will depend first, on availability of basic chemicals, including styrene monomer, diabasic acids for the production of the alkyd section of the resins, and peroxides for catalysts; second, on the availability of glass reinforcement; third, on the corporate stamina of individual companies in the field so that quantity production may may not be stymied by plant limitations; fourth, on well integrated specialization by molders and fabricators so that companies will do what they are best at rather than skipping around with techniques to which they are attracted but unaccustomed; fifth, on the principle, established since the close of World War II, of quantity production with economy.

The plastics baby of World War II has a big job ahead of it.

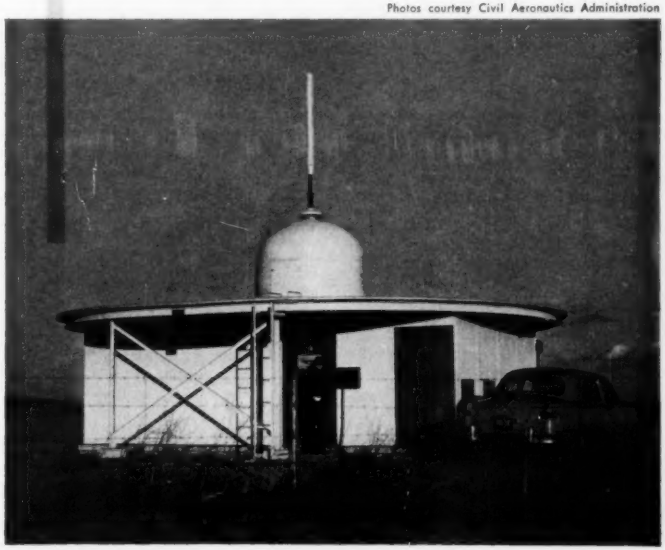
Omnirange antenna is protected from weather by "derby" of glass fiber, polyester resin

Radomes for Range Stations

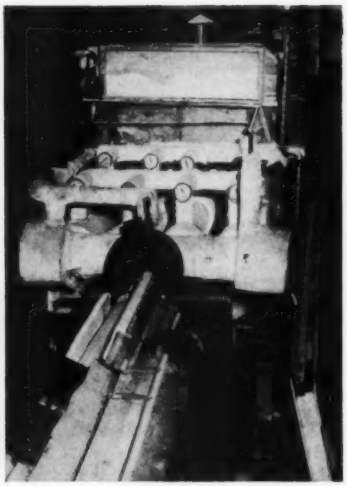
CIRCULAR plastic domes have been adopted by the Civil Aeronautics Administration as shelters for the precision equipment in omnirange stations. These stations transmit radio signals in all directions and are part of a new very-high-frequency air navigation system now being installed. The domes, 8 ft. in diameter and nearly 7 ft. high, are made of glass fiber and polyester resin by E. L. Cournand & Co., New York, N. Y. This material was adopted after CAA tests showed it to be the only one which would provide the required protection for the omnirange antenna without distorting the signals transmitted through it. The plastic domes weigh only about 350 lb. each and thus can be shipped and installed easily. They replace square, rather bulky, antenna houses now in use atop omnirange towers. From the air, one of the new range stations looks like a small building surmounted by a metal covered deck 35 ft. in diameter with the plastic dome in the center. The station thus looks like a gigantic white derby. Cournand received an initial contract to produce 100 of the domes, and delivery began last summer. The CAA plans eventual installation of 400 of the new domes on the country-wide network of omnirange stations.

Plastic domes are nearly 7 ft. high and 8 ft. in diameter yet weigh only 350 pounds. CAA plans to install 400 such domes on nation's airways

Photos courtesy Civil Aeronautics Administration



Installing a gun plug made of expanded cellulose acetate in gun port of fighter fuselage. Another plug is visible just forward. The plugs maintain streamlining and protect gun barrels from dirt



Rod stock is forced onto conveyor. Restraining forms keep rod from coming out of die too fast

Gun Plugs For Jet Fighters

WHEN Republic F-84E jet fighters take to the air, the openings in the fuselage and wings through which the 50-caliber machine guns fire are protected with plastics. These plugs are expendable. When the guns are fired, the plugs are blown out and are replaced when the plane lands again.

The reason for these gun plugs is two-fold. First, they preserve the aerodynamical cleanliness of the fuselage and wings; secondly, they protect the gun barrels from dirt and moisture.

Because of the location of the four machine guns in the fuselage it was necessary to find an expendable plug material which would not injure the turbine in the jet when blown out by the first burst of gunfire. Many materials do not disintegrate sufficiently and it was necessary to find something that would be instantly converted to a fine powder. The problem is greatly complicated by the reason that a considerable surface of the plug is directly exposed. The wind blast and the erosion effect of rain and hail at advanced jet speeds are terrific. The material finally selected was Strux—expanded cellulose acetate. In the case of the plugs over the wing guns this quality of disintegration was not necessary; the gun ports are far enough away from the jet intake that there is no possibility of fragments of the plugs getting into the turbine. Hence, the wing port plugs are molded of low-pressure polyester material.

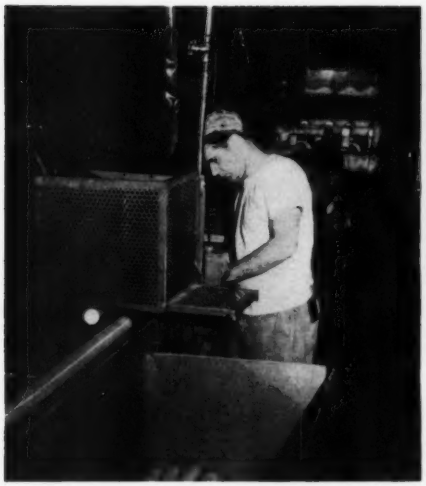
All of the Strux gun plugs for the F-84E are produced by Aircraft Specialties Co., Hicksville, N.Y. Hercules acetate flake is used, being prepared in a special formulation for the extrusion operation employed. The flake, as received by the extruder, is dried to a point where its moisture content is ½ of 1% or lower. After drying, the flake is mixed with a small percentage of chopped Fiberglas fibers to add strength to the final product. This mixture of flake and fiber is then pulverized in a hammer mill to pound the glass particles uniformly into the flake.

From the hammer mill, the compound goes to a mixer where a liquid foaming agent is added. The composition of the foaming agent is held secret but only a very small quantity of the agent is employed.

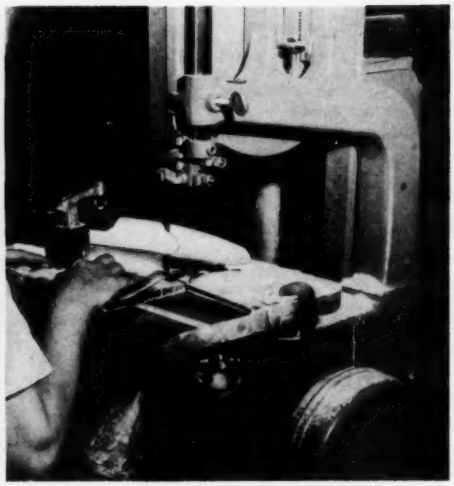
From the mixer, the powdered material is placed in an over-head hopper from which it feeds to a compacting machine made up of a pair of rolls leading directly into a granulator. The powdered mixture, fed at a controlled rate, is compacted into a sheet between the roll mills. This sheet is then ground to small particles by the granulator, after which operation the material is ready for extrusion. From this point on, the acetate-glass compound must be extruded within a matter of hours or else stored in air-tight containers. It is extremely hygroscopic, and must not be permitted to pick up moisture before extrusion.

Extrusion

An unusual type of extruder is used for producing the rod stock from which the gun plugs are later fabricated. The extruder hopper feeds directly into four round extrusion tubes. These tubes are approximately 8 ft. long, and the material is pushed through them by means of reciprocating plungers. The plunger end of the extrusion tubes is held at a low temperature so that the ma-



Lengths of rod, cut by guillotine-type cut-off, are pushed off belt by pneumatic plunger (left) into packing carton



After lathe turning, rods are mounted in a jig and cut at a sharp angle by a band saw to conform to contour of fuselage

terial will not yet start to expand and jam between the tube walls and the plunger.

Heaters are arranged along the length of the four extruder tubes so that as the material is forced through it encounters sources of increasingly greater heat. The heat causes the material to expand.

The four initial extrusion tubes feed into a large enclosed accumulator to the face of which is attached an extrusion die. Through a combination of forces created by the expansion of the material and by the action of the extrusion plunger, a pressure of approximately 800 p.s.i. is built up. This pressure forces the expanded material through the die onto a conveyor belt. Because the front part of the die is heated, the outside surface of the extruded rod is smoothed as it is extruded.

To prevent the rod from coming out of the die faster than it should, several restraining forms, prepared to fit the outer contour of the rod, are assembled along the conveyor belt. As the rod is carried by the conveyor belt from the extrusion machine to a guillotine-type cut-off, it cools sufficiently so that it can be cut to length without crushing. At the cut-off machine, a pneumatic plunger automatically pushes the cut lengths sideways into packing cartons. Seasoning of the cut lengths is accomplished by holding them in an oven for approximately 16 hr. at 150° F. After seasoning, the rods are ready for fabrication.

Fabrication

First step in fabrication is to cut the rods to length. The cut parts are then lathe turned to the approximate outside diameter called for by the specifications and are further sized to accurate dimensions.

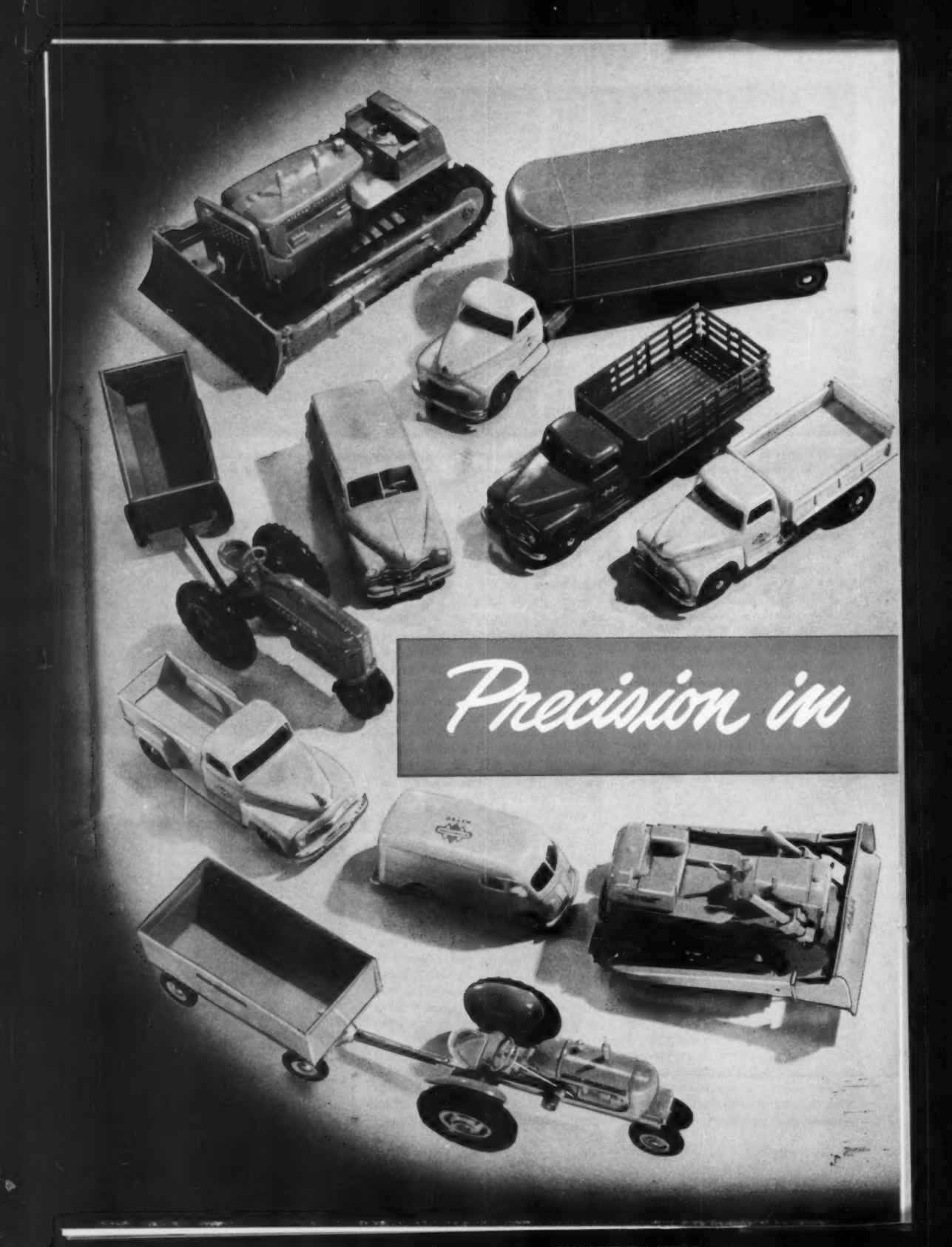
Because the plugs must conform to the contour of the airplane fuselage, the turned rods are next cut at a sharp angle by a band sawing operation. For this cut, the rod is mounted in a jig. The opposite end of the rod from the angular cut is then bored to fit over the muzzle of the gun. Final machine finishing involves jig sanding of the tapered edge.

After the machining operations are complete, a special filler is applied to the flat angular face in order to produce a smooth clean surface. The plugs are then dipped into a finishing lacquer and allowed to dry. Strux, or CCA, by which name it is often known, is produced in a continuous extrusion process. It is available in board form as well as in rods and other shapes.

All of the work on the Strux gun plugs is done by Aircraft Specialties; the polyester Fiberglas plugs are molded at Republic Aviation Corp., Farmingdale, N.Y.

End of rod opposite from angular cut is bored to fit over muzzle of gun

Jig sanding tapered edge of gun plug is final machine finishing operation


Precision in

Miniatures

USING molds made from actual factory blueprints of trucks, tractors, and passenger cars, plastics miniatures are being produced for a number of automotive manufacturers. These miniatures, to be used not only as promotion devices but also to be sold as toys, capitalize to the fullest on the colorful effects obtainable in plastics as well as on the infinite detail which can be incorporated in plastics molds.

This work on precision miniatures is being done by Product Miniature Co., Inc., Milwaukee, Wis., where small scale models of standard equipment are being produced for International Harvester, Allis-Chalmers, General Motors, and Chrysler.

Both the scale of the model and the amount of detail which is incorporated into a replica is determined by the type of machine being reproduced in miniature and by the purpose which the model is designed to fill. For example, International Harvester's new line of trucks is reproduced in the scale of 1 to 20. In this comparatively large scale the model trucks have enough bulk weight and detail to make them exciting and interesting as toys. On the other hand, the latest models to be produced by Product Miniature—the 1951 line of Chevrolets in 7 different body styles and 12 colors—is in the scale of 1 to 25. This somewhat smaller scale makes it possible to package a set of 12 miniatures in the form of a "color kit" for use by Chevrolet dealers. The miniatures are still large enough to be interesting and to include quite a bit of accurate detailing, yet they are easy to handle and can be carried off without the use of packaging or wrapping when handed spontaneously by a dealer to a prospective customer. (The Chevrolet models are so designed that they are also banks. A metal insert which forms the windows of the model provides about 25 cu. in. of space for coins.)

A number of considerations go into Product Miniature's decision to manufacture scale models of any specific piece of automotive equipment. Necessary, of course, is the full cooperation and consent of the manufacturer of the product to be reproduced—be it truck, tractor, or automobile. Once the builder of a piece of automotive equipment becomes interested in using a plastic scale model for promotional purposes, Product Miniature undertakes to construct a mold at its own expense, a major part of the cost of which it expects to amortize in the course of producing a supply of miniatures for promotional use. At the same time, the manufacturer of the full-sized equipment agrees to let Product Miniature sell scale models as toys. That part of production which is allocated for this purpose is retailed in a limited number of exclusive toy outlets under the name "Tru-toys."

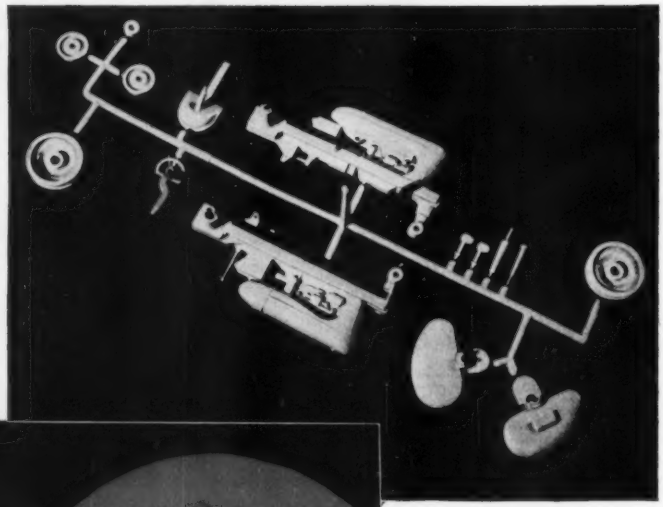
In designing a miniature from factory blueprints, a number of factors are considered. On tractors, for example, much attention is given to such details as controls and pulley wheels, while on models of noncommercial vehicles the style and details like radiator ornaments and chrome trim provide the accent needed to make the model interesting to prospects.

In the Product Miniature models both the body and the chassis are plastic, yet by proper design they

Opposite page: Scale models of trucks, tractors, and station wagons have wide range of molded-in detail. Below: Chevrolet miniatures are made in all body styles, in all available colors

Photos courtesy Hercules Powder Co.

Right: The 15 molded ethyl cellulose parts for an Allis-Chalmers tractor miniature as they appear when removed from the mold and before they are clipped from the sprue. The material used is either Hercocel E or Ethocel. Nine of the steps in the assembly of this model, after molding, are illustrated on these pages, the sequence starting on the opposite page



Tractor miniature passes final inspection. Models of this type are complete in such important sales details as control levers, steering wheel, pulleys, etc.

All photos courtesy Hercules Powder Co.

4—Mounting metal draw bar on rear of body

5—Mounting rear fenders

6—Mounting front wheels on shaft

1—Mounting tires on front wheels

2—Mounting tires on rear wheels

3—Fixtures clamp cemented body halves

are so constructed that the finished piece has remarkable strength. For example, the small pickup truck in the International line will support the weight of a 250-pound man.

Part of the secret of the strength and durability of the models is due to design, but a bulk of the credit must go to the selection of plastic materials. Both ethyl cellulose and cellulose acetate are used, the choice between the two materials being determined primarily by the type of model being molded. At present, to obtain the ultimate in structural strength, all of the farm equipment models are molded from ethyl cellulose. Hercules' Hercocel A cellulose acetate molding powder is used in the International trucks and in the Chevrolet models. The cellulosic materials, in addition to being simple have also scored an excellent record in shipment. Product Miniature has found, as has many another manufacturer of plastics parts, that the most important testing laboratory which it has to face is the U.S. mails.

So far only one Product Miniature model has been "mechanized." This is a large bulldozer modeled after one of International's big diesel-powered crawler tractors. It has been built to incorporate a mechanism which makes it possible to operate the unit by remote control through a cable connected to a transformer. Because it would be impossible to mechanize any of its other models without greatly increased cost, Product Miniature has stayed away from motor-driven models. No spring windup mechanism could last the full service life of one of these sturdy plastic models. Such a mechanism would, therefore, sooner or later cheapen the miniature and make it "just another toy."

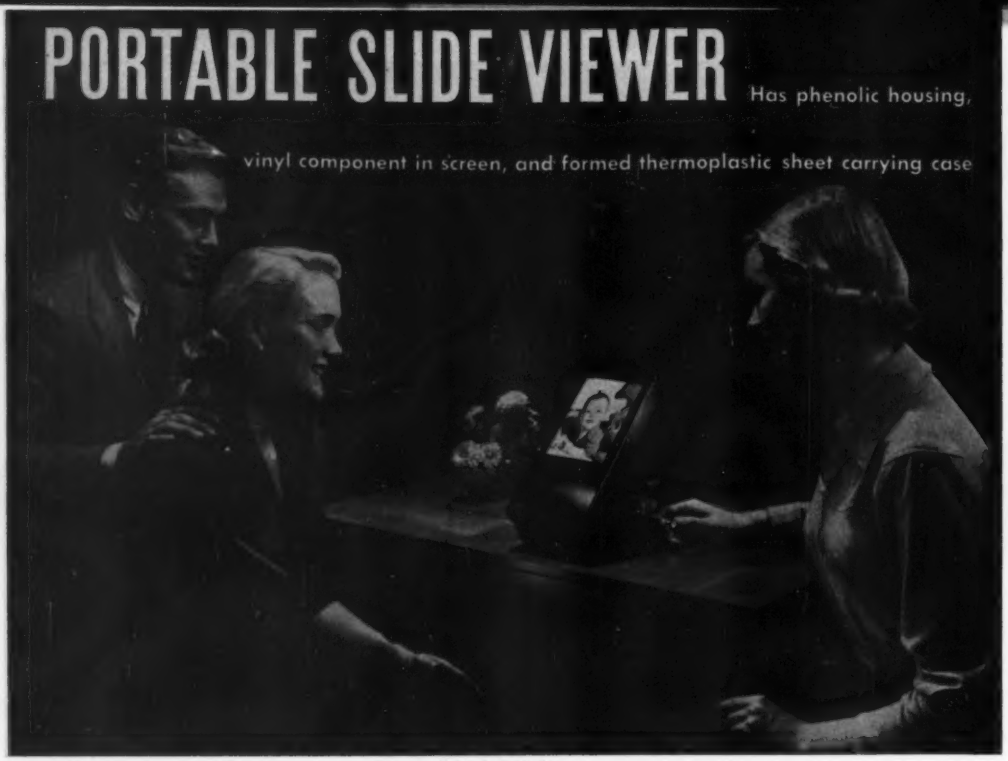
7—Mounting rear wheels with rivets

8—Mounting pulley, steering wheel, seat

9—Applying decal name plate

PORTABLE SLIDE VIEWER

Has phenolic housing, vinyl component in screen, and formed thermoplastic sheet carrying case



Courtesy The FR Corp.

Phenolic viewer is put into action simply by lifting cover which incorporates 6-in. square screen—a laminate of glass and vinyl

A SLIDE viewer for 35-mm. films, which is really portable as the result of the use of phenolic in its major component parts, is known as Port-A-View. This latest product of The FR Corp., New York, N.Y., is reported to be the smallest film viewer of its type on the market today. Because it is self-contained and needs only to be plugged into a 110-v. circuit to be put into operation, a large market is foreseen among both camera fans and sales organizations. Camera fans can take it with them on visits to friends' homes where they can proudly display the latest products of their hobby. Sales organizations see in the Port-A-View a means whereby a salesman can bring to colorful life, right on the desk of a potential customer, a large number of views of the company's products.

The plastics materials used in this 4-lb. film slide viewer include phenolic for the housing and two interior parts, a layer of vinyl film in the viewing screen, and Royalite, a thermoplastic sheet which is formed to produce a durable carrying case.

Even though the FR film viewer is comparatively small in size and light in weight, it projects a picture onto a 6-in. square screen. This screen, a special T.V. type, is a laminate composed of glass and vinyl film. Two sheets of glass are used, one clear and one ground, with the vinyl film sandwiched between them. This special screen, in combination with the optical system employed, produces a picture enlarged 16 times from the original film whch can be seen with perfect clarity and definition, even in broad daylight.

The viewer is designed with a built-in automatic plunger type slide changer which operates with finger tip pressure. Thirty-six ready-mount cardboard slides can be shown individually without refilling the magazine; storage space is also provided for 72 ready-mount slides. Most other types of film slide mounts can be used interchangeably in the slide changer.

There are four molded phenolic parts in the film viewer, all of which are produced from Durez molding compound. These parts include the base and cover, which form the housing of the viewer, a condenser housing, and a lens mount. Single-cavity molds are used for producing each piece, the molds having been built by the molder, Plastic Molding Corp., Sandy Hook, Conn., under the supervision of The FR Corp.

Three Molding Methods

Compression, transfer, and plunger molding methods are all employed in producing the phenolic parts of the viewer. The cover is molded by compression, the base and condenser housing by transfer, and the lens mount by plunger. To produce the trade-name "Port-A-View" on the cover, the lettering is raised in the cavity of the mold, thereby reproducing as depressed lettering on the molded part. Finishing involves a color "wipe-in." The lettering for the "FR" is depressed in the cavity to produce raised letters on the molded part. These letters are later masked and sprayed with paint.

Ingenious die design and molding techniques contributed to the economical production of the phenolic parts. For example, none of the dies is equipped with cam action or removable inserts, despite the fact that the design of the base calls for molded-in slots underneath transverse walls. This result was achieved in molding by the design of the cavity itself.

In another part of the base it was necessary to provide for a mirror mount, the design calling for an undercut and a slot. This was achieved by molding from two sides with a side lock-out in the cavity. Thus the undercuts were produced without the necessity of resorting to movable mold parts.

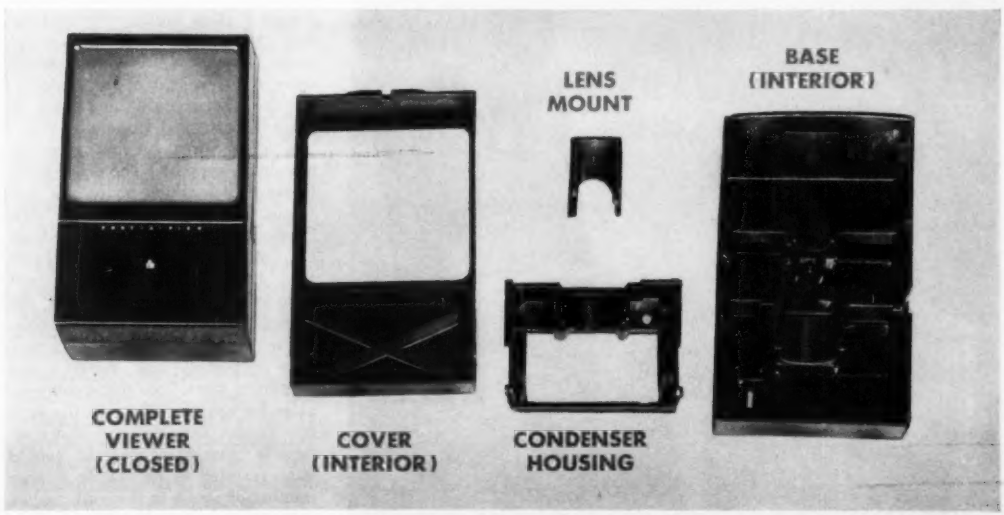
When the cover mold was first put into production, the flat top surface on which the lettering was molded tended to "belly" severely. To prevent this, the force plug was machined to mold the two crossed reinforcing ribs which can be seen in an accompanying photograph.

The optical system of this viewer consists of ground and polished double condensers, an *f*./3.3, 50-mm. color-corrected projection lens, and a front-surfaced optically flat reflecting mirror. The light source is a standard 50-watt 110-v. projection-type lamp.

The basic principle upon which this viewer operates was developed by Robert Barth, FR's chief engineer. In addition, much of the credit for the design of the unit goes to Lippincott & Margulies, Inc., New York, N.Y., who styled and engineered the unit.

To provide a suitable carrying case for this unit, which would also be light in weight because of the stress on portability, Royalite was selected to do the job. The case itself is draw-formed from 1/8 in. Royalite sheet by Bassons Industries Corp., New York, N.Y. Design of the case calls for two-piece construction with a hinge at one end and with a double strap arrangement for carrying the case either in the hand or over the shoulder. The simple hinge consists of two rivets, set up to provide adequate tension so that the cover will remain in the open position without the need of a support.

Left: Carrying case, of thermoplastic sheet, has double strap for carrying either over shoulder or in hand. Right: Taking viewer from two-part case. Hinge holds cover open



Complete slide viewer (left) followed by four main phenolic parts. When lid is closed, viewer is completely self-contained. All components are made in single-cavity molds. Cover is compression molded; base and condenser housing by transfer; lens mount by plunger

Vinyl and

Above: New research tower containing unusual plastics applications rises above adjoining administration center (foreground). Below: Dome skylight in roof, 25 ft. in diameter, consists of ⅜-in. thick sections of acrylic sheet capped by an acrylic bubble (left)

SEVERAL interesting new architectural applications for two plastics—elastomeric vinyl and sheet acrylic—are found in the new 15-story research and development tower recently completed by S. C. Johnson & Son, Inc., Racine, Wis. The unique structure, conceived by architect Frank Lloyd Wright as a functional building of striking appearance, involved advanced design concepts throughout and was under construction approximately three years.

Rising more than 150 ft. high, the tower is 40 ft. square, yet at ground level is supported by a central cone only 13 ft. across at the narrowest point. Each of the 15 floors is cantilevered from this core, which is anchored to a concrete foundation penetrating 54 ft. into the earth, like the taproot of a tree. Floors are in pairs, with 40 ft. square floors alternating with circular floors slightly less than 40 ft. in diameter. This arrangement facilitates communication and permits the installation of tall laboratory equipment based on the circular floors.

Vinyl Extrusions

The glass walls of the structure are constructed of 21 miles of 2-in. diameter glass tubing separated by vinyl strips and anchored in vinyl rings. These glass tubes, which carry none of the weight of the building, are laid horizontally and held in place against vinyl gaskets by stainless steel wires binding them to aluminum supports. The elastomeric Koroseal separating strips are extrusions supplied by the Plastic Products Div., The B. F. Goodrich Co., Marietta, Ohio. Of the more than 120,000 ft. of extruded vinyl strip employed in the building, the majority consists of rectangular tubing with curved surfaces which provide a perfect seal between the lengths of glass. This shape compensates for any variations in the surface of the glass; the use of a nonflexible gasketing material would have resulted in no seal at a large number of places in the walls.

To anchor the lengths of glass tubing to the aluminum supports, approximately 30,000 coupler rings

Acrylic in Fabulous Lab

were used, molded by Goodrich of the same material. The rings are of a multiple flange design which insures a firm grip and a tight seal between the glass tubes and the brass plugs over which the vinyl rings are placed. Here, again, the flexibility of the vinyl material was important in making a standard size metal plug suitable despite variations in the inside diameters of the glass tubes placed over them.

The Koroseal compound used in the extrusions and the molded coupler rings is Grade 9177, developed especially for construction work and characterized by exceptional aging qualities. Its blue-grey color blends well in a variety of building applications.

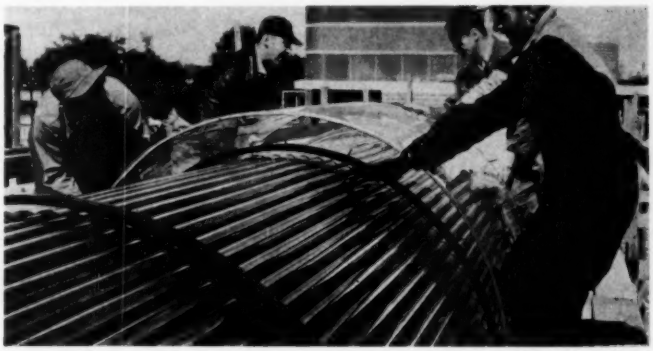
Acrylic Sheets

Formed sheets of clear transparent Plexiglas figure prominently in the 60-ft. passageway connecting the new laboratory with the Johnson offices, and in the large dome skylight on the roof of the building. Over the lengths of glass tubes forming the ceiling of the passageway is a continuous U-shaped cover, made of ½-in. sheets of the acrylic material, each formed into a half-cylinder with 24-in. radius. The dome skylight, 25 ft. in diameter, is composed of formed acrylic sheets mounted in steel H-channels. These sheets, 0.375 in. thick, range up to 60 by 90 in. in size. They are arranged in three circular tiers, with a shallow acrylic bubble forming the cap of the dome skylight.

Fabrication and installation of the acrylic sections for skylight and passageway were by Universal Plastics, Inc., Milwaukee, Wis., working closely with representatives of Rohm & Haas Co., Philadelphia, Pa. The dome panels have a slight compound curvature, which was achieved by heating the sheets with a revolving bank of infra-red lamps until pliable, then draping them against a female mold to cool. The acrylic material was used because of its resistance to breakage, the facility with which large sheets could be formed, and its light weight. A 60- by 90-in. sheet of the ⅜-in. material weighs only 87 pounds.

Courtesy The B. F. Goodrich Co.

Installing vinyl separating strips on glass tubes which form exterior walls of tower. Ends of tubes are anchored in molded elastomeric vinyl rings placed over brass plugs

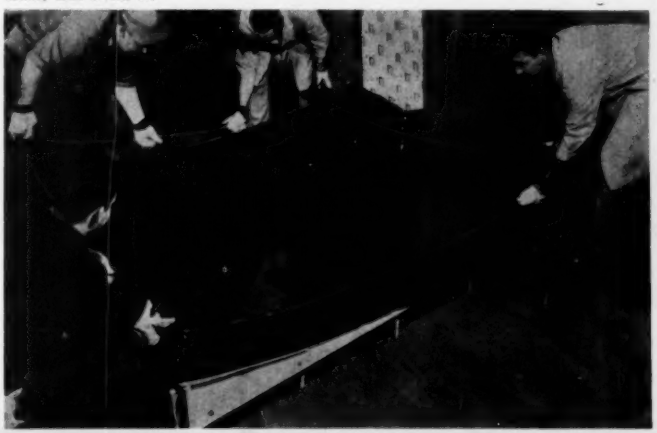


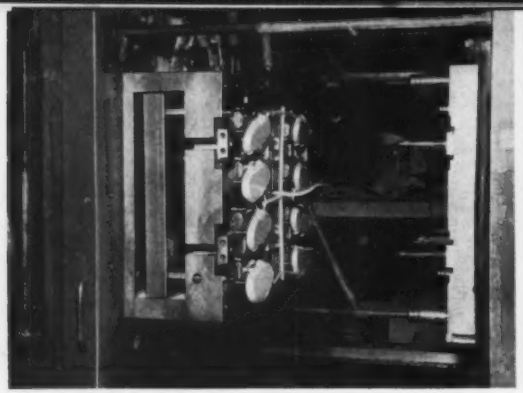
Courtesy Rohm & Haas Co.

Half cylinder, 24 in. in radius, formed of ½-in. acrylic sheet, is placed over glass-tube ceiling of 60-ft. passageway connecting new laboratory tower with office building

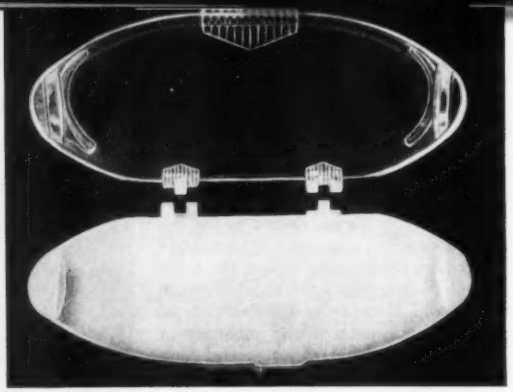
Fabricating acrylic sheets for skylight dome. Slight compound curvature of large sections was achieved by heating panels, then drape-forming against a female mold until cool

Courtesy Rohm & Haas Co.

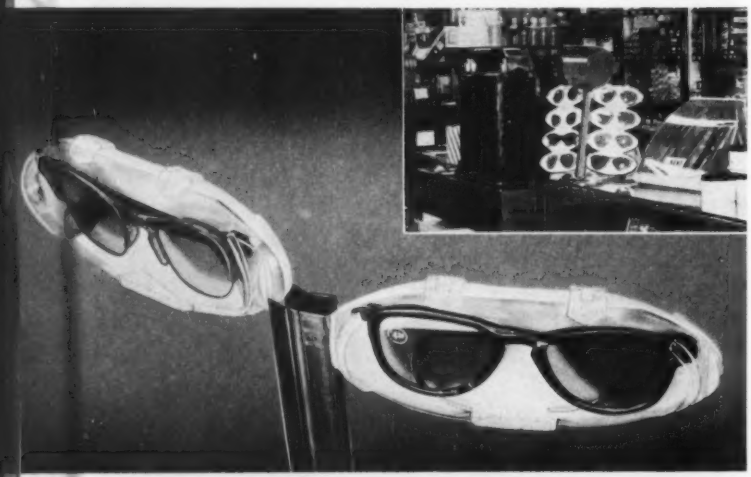




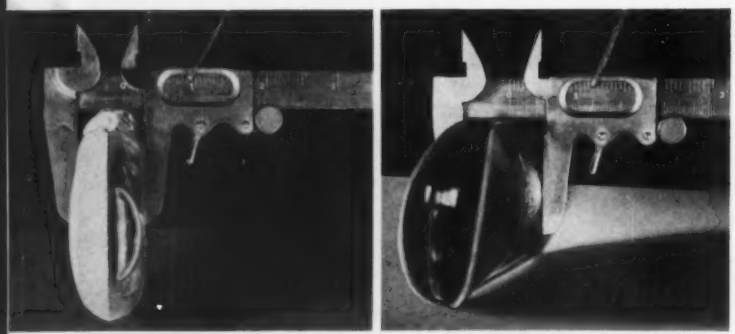
Eight-cavity mold is used to produce the opaque bottoms and transparent tops of sunglass cases. Undercut for catch is molded without cams



Top and bottom of case, identical except for color, are assembled by driving two metal hinge pins. Note molded-in slots at each end



Molded-in slots allow sunglass cases to be slipped into place in steel channel in counter display unit which is slanted so that cases cannot be removed from the front



Styrene case is thinner than the leather pouch it replaces, can be carried easily in pocket or purse. Because it is rigid, it protects glasses better than did leather pouch

Styrene

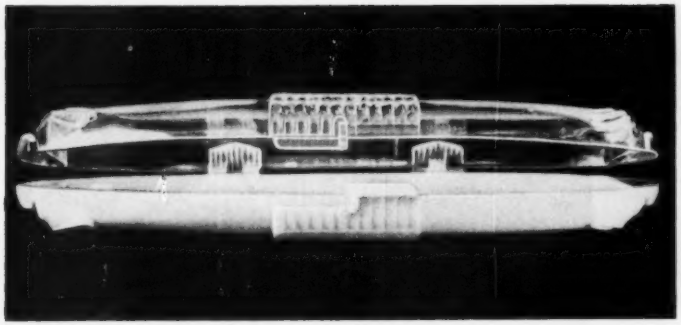
AN unusual number of functional features are built into the Safe-T-Pak, a molded styrene case for sunglasses made by Willson Products, Inc., Reading, Pa. The two-part styrene case doubles as an attractive, pilfer-proof display package as well as a compact, convenient, and serviceable carrying case for the product.

Study Preceded Design

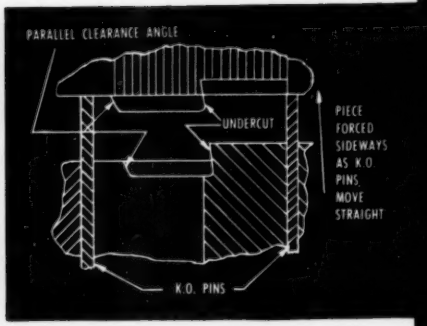
The Safe-T-Pak was developed as the result of a fact-finding survey undertaken to find out how sunglasses were being merchandised and how Willson Products could get a larger share of the market. The survey, made for Willson Products, through the marketing division of Consolidated Lithographing Corp., by James J. Jacobson Associates, New York, N. Y., revealed that the display cases being furnished to retailers were losing their effectiveness.

The retailers were being furnished with all sorts of displays by the manufacturers, but when they ordered their mid-season fill-in stock, most got competitive goods and put them into the counter display case along with the original brand. This showed the need for a display case which could not be shared with competitive glasses.

Another important finding of the survey was the need for a display which would protect the merchan-



Lug on each half of styrene case was designed as an insert in force side of the mold. Extreme edges of the lugs on the two parts of box snap past each other and hold the box firmly closed



Parallel clearance angle on lug opposite undercut allows piece to slip sideways out of mold

Case Sells More Sunglasses

dise against pilferage so as to make it possible for the retailer to put the merchandise in a prominent position on the counter.

As a result of these findings, Jacobson Associates designed the Safe-T-Pak with molded-in slots at each end. These slots fit into a chrome plated steel channel. Two such channels, side by side, are part of the mirror-topped display unit known as the Safe-T-Slide, which holds eight Safe-T-Paks. Because the channels are slanted toward the rear of the counter, the individual packages can be removed easily by the store clerk, but cannot be removed from in front of the counter.

Since the introduction of the new package, Willson's sales have shown gains running into hundreds of percent in some territories.

Two Halves Identical

The case itself has a clear styrene top and an opaque bottom. The requirements demanded a strong snap action clasp and hinges with an opening radius limited to 90 degrees. To keep mold costs down, the two halves were designed so as to be identical in all but color.

The need for a strong snap action clasp necessitated use of a severe undercut, but a way was discovered to avoid the use of a costly cam action in the mold. The hinges and clasp were designed as inserts in the force side of the mold. The undercut thus formed an angle of the clasp past which the piece has to move when coming out of the mold.

By arranging the knockout pins to achieve a maximum of spring effect and providing a parallel clearance angle near the undercut, it was found possible to make the piece move slightly sidewise as the knockout pins forced it out, thus fully clearing the undercut. This avoided the expense of a cam, and the simplicity of the mold accelerated the molding cycle.

In the finished box, the extreme edges of the undercuts on the two parts of the box snap past each other and hold the box firmly closed.

The mold for the box was made by Dusal Tool & Mold Co., Inc., New York, N. Y., and the box is molded by Majestic Molded Products, Inc., New York, N. Y. The molder also assembles the box by driving two metal hinge pins with an Auto-Nailer.

Features of Box

In addition to its value as a display box, the Safe-T-Pak is an efficient carrying case for the sunglasses it contains. It is somewhat thinner than the leather pouch it replaces, and will slip easily into the pocket or purse. Because it is rigid, it gives more protection than did the leather pouch.

A small metal clip was also designed to hold the styrene case securely at the user's belt or to clamp it onto the sun visor of a car. A number of these clips, each holding a Safe-T-Pak, can be fastened together chain fashion to make a hanging display.

Small metal clip can be attached to case to hold it at the user's belt or on sun visor of a car

Right—The back seat of a car can be converted into a crib or play pen for the baby with the Kiddie Keeper, made of 12-gage vinyl. The device can be installed or removed in a few minutes and can be rolled up or used as a seat cover when not in use to keep the baby from falling. Rear doors cannot be opened while the Keeper is in place. Made by Kaydon Mfg. Co., 2027 Broadway, Santa Monica, Calif.

Below—Keg molded of Luxtrex styrene is 8 in. high, holds three pints. Six shot glasses shaped like beer mugs hang on hooks molded-in to the sides of the keg. The "bung" and spigot of the keg are made of polished brass. This bar accessory is made by Chatham Glass Corp., 119 W. 19 St., New York 11, N. Y.

PLASTICS

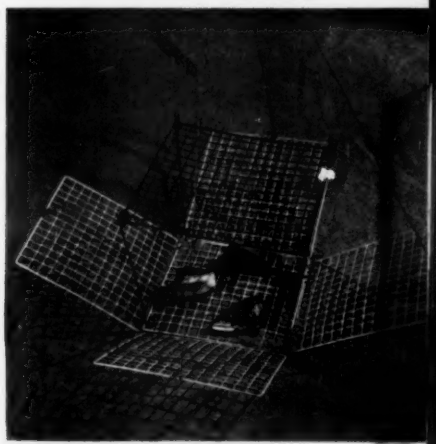
Below—Bookends molded of styrene automatically close or open when book is removed or inserted. The two bookends are connected by a tape which is wound around a spring-loaded roller inside one of the bookends. The tape is concealed by the books. Manufactured by Lordell Corp., 219 W. Chicago Ave., Chicago, Ill.

Above—Multi-purpose compartment case molded of Plaskon urea is lined with satin velvet, has deeply molded relief design on lid. Case is 5½ by 3½ by 3⅜ in., is available in pink, blue, ivory, green, or red with either Oriental or Colonial scenes on lid. It is molded by Nichols Plastic & Engineering Co., 13007 S. Main St., Los Angeles 3, Calif., and manufactured by Fran McKen Co., 835 Bay St., Santa Monica, Calif.

Left—Water-going carousel is made of 12-gage Vinylite sheeting, has six inflatable, multi-colored horses mounted on the 7-ft. base. Horses and base inflate separately. The base is constructed so that it does not tip. Smaller version has four horses on 4½-ft. base. The Merry-Ring is manufactured by Bilnor Corp., 53-06 Grand Ave., Maspeth, L. I., N. Y.

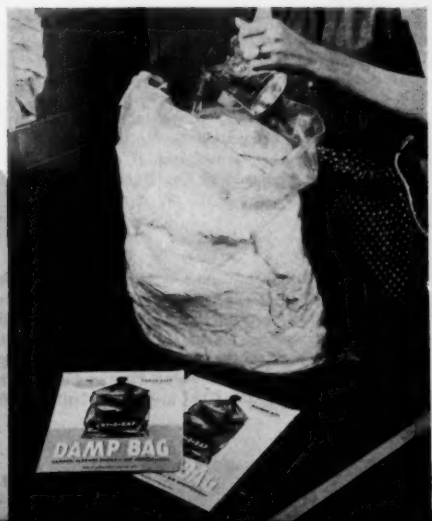
Below—Heavy vinyl coating on metal wire crab trap prevents it from rusting or corroding, thus lengthens its life. Coating also strengthens the welded joints. Hinged sides of trap open when tension on cord eases, close when trap is hauled in. Trap has yellow sides and bottom, red top. Made by The Washburn Co., 28 Union St., Worcester, Mass.

PRODUCTS



Above—The Jetgo United Nations Freedom Plane is molded of styrene, has the swept-back wings, wing tanks, and needle nose of a real jet fighter. The multi-colored toy plane is 7½ in. long, 8½ in. wide, and is packaged in a colorful display box with the flags of the United Nations on it. Flexible needle nose will not break. Made by Nosco Plastics, 1617 Cascade St., Erie, Pa.

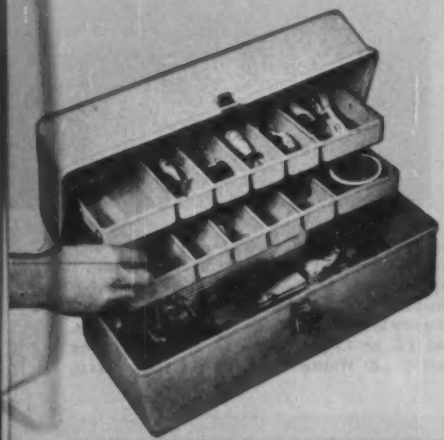
Below—Cry-O-Rap laundry dampening bag is fabricated of saran film. Laundry left in the bag with a few cups of water is uniformly dampened in a few hours as the moisture diffuses. Large bag, 24 by 39 in., holds over 10 lb.; medium, 18 by 36 in., holds 7 pounds. Made of 1.6- or 1.7-gage saran by Dewey & Almy Chemical Co., 62 Whittemore Ave., Cambridge, Mass.



Above—One-piece green Polaroid sunglass has dark beige eye shield made of extruded Tenite II cellulose acetate butyrate sheet. Cord holds sunglass in place and angles shield correctly. The whole unit is light in weight, folds flat when not in use. Sheeting for eye shield is extruded by Plax Corp., Hartford, Conn. Unit is made by American Optical Co., Southbridge, Mass.

Below—Salt and pepper shakers which resemble garden sprinklers have molded transparent styrene bodies, polished metal tops, bottoms, and spouts. Contents are always visible, and tops are quickly removable for easy filling and cleaning. Each of the shakers is 2½ in. high. Sold in sets of two by Dart Craftsman Corp., 240 Madison Ave., New York 10, N. Y.

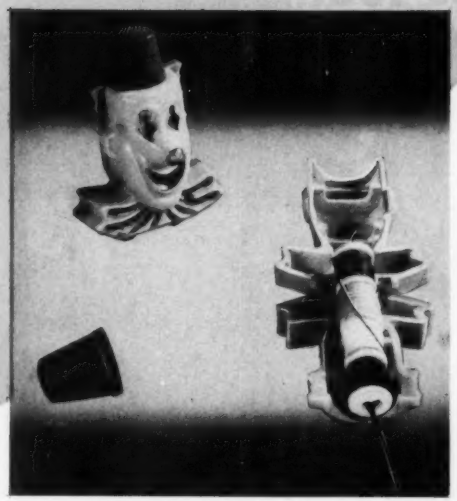
PLASTICS



Above—Durable fishing tackle box is made of Fiberglas mat and polyester resin. The piano-hinged box is rustproof, corrosion proof, will not dent or warp, and is guaranteed by the manufacturer for life. The 17- by 8- by 8-in. box has two trays and has a ruler molded-in to the cover. It can also be used as a tool box. It is made by Hamilton Metal Products Co., Hamilton, Ohio

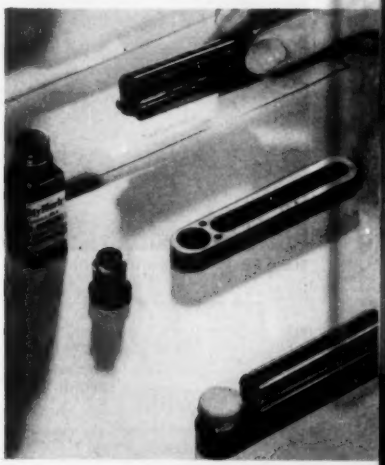
Right—The Sling-Bow, a cross between a sling shot and a bow, is designed for use on small game as well as on targets. Removable wire arrow-guide spans the crotch in the molded Tenite II cellulose acetate butyrate bow. Rubber tubing slings are attached with cap nuts. Bow, molded by Flambeau Plastics Corp., Baraboo, Wis., is made for Glo-Lure, Inc., Medford, Wis.

Below—Colorful cellulose acetate clown head conceals a sewing kit with four small spools of thread and a supply of needles. The clown's hat, released when the hinged kit is opened, serves as a thimble. The Clown's eyes, nose, and mouth are hand painted. The sewing kit is manufactured by Novo-Plas Mfg. Co., 275 Front St., Brooklyn, N. Y.

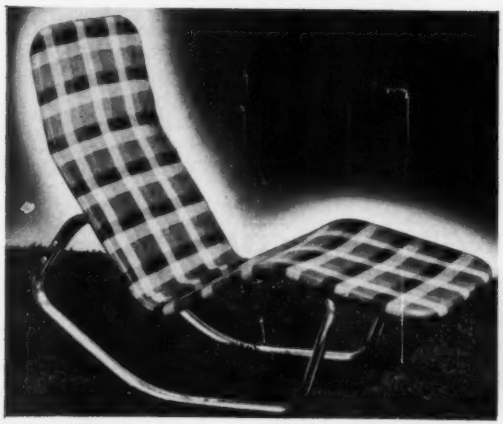


Above—Simulated crab shell dishes for serving crab meat dishes and other types of sea food are molded of Melmac. They are convenient to handle and store, resistant to breakage, and easy to clean. The ivory-colored melamine shells are made by Abar Plastics Co., 6940 Formosa Way, Pittsburgh 8, Pa.

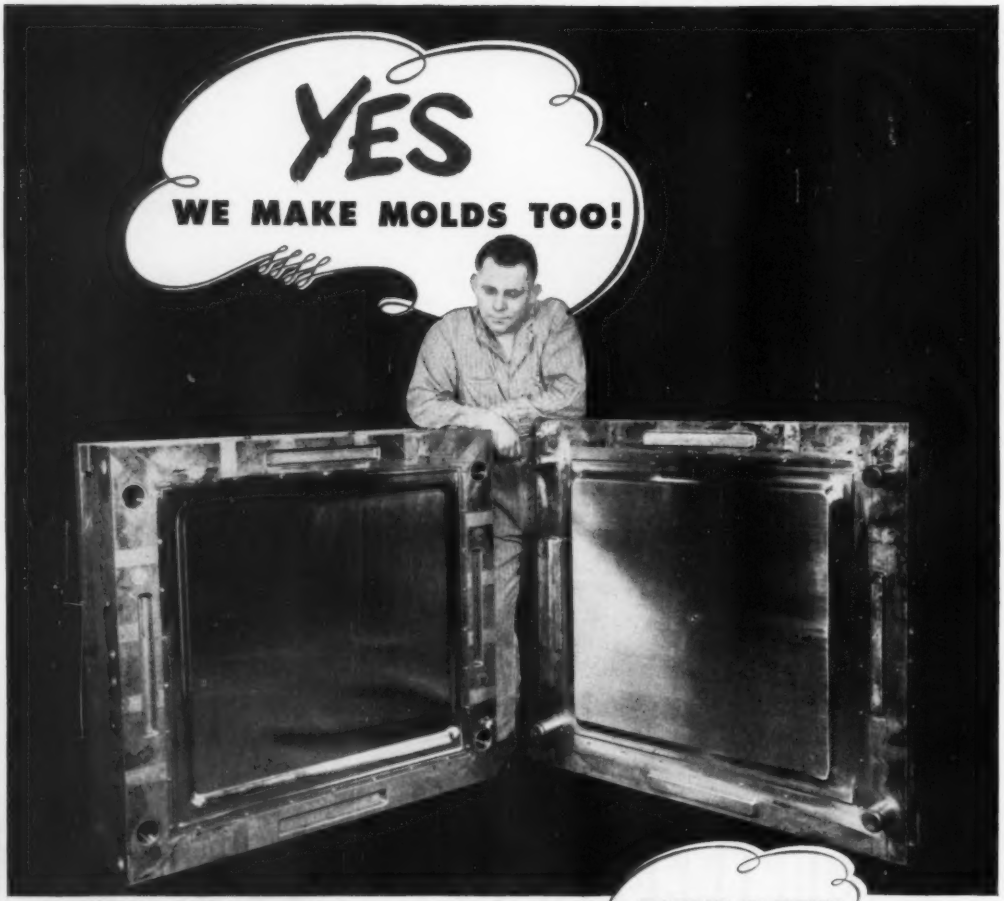
PRODUCTS



Above—Personalized MyMark clothes marker is housed in Tenite II cellulose acetate butyrate. Device consists of round black ink pad holder and a red name bar holder which rest in a black base. Metal letters are set securely in the slotted bar holder. Marker made by Holiday Products Co., Box 965, Dayton 1, Ohio.



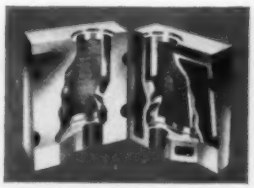
Left—The Barwa chair, built on the rocker principle, has frame made of 1¼-in. aluminum tubing. The chair is now available with seat made of Lumite woven saran fabric in red, yellow, and green plaid. The saran seat, like the aluminum frame, withstands weathering and is easy to keep clean. Chair is a product of Ralph Elliott Co., 3227 Fowler St., Los Angeles 63, Calif.



Made for Prolon Plastics, Northampton, Mass.

HOBBED CAVITIES by MIDLAND

One of our good Hobbed Cavity customers recently astounded us by saying he didn't know we made *molds* too. The truth of the matter is—if we didn't know a great deal about mold-making we could never have become the country's outstanding producer of hobbed cavities. Just to prove that molds are a big item with us, look at the big item shown above; a refrigerator door mold—designed and produced by Midland. Whether you need molds or hobbed cavities, large or small, it will pay you to specify Midland—where know-how puts quality first. Send your prints, without obligation of course.



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Matched Molds for Reinforced Plastics

How to design and construct good production molds. Details of ejection method for blowing molded parts from the male half of the mold

by ARTHUR J. WILTSHIRE†

PRODUCTION methods for forming reinforced plastics have, for many applications, changed considerably from the old familiar rubber bag and autoclave procedures of a few years ago. Today, molds frequently employed are similar in many respects to those used in injection and compression molding. These molds are known as matched metal molds. Basic requirements for a material from which to make good production molds of this type are as follows:

1) It should lend itself readily to casting. In molding reinforced polyester laminates, where high pressure is not used, it is not necessary to consider the use of forged steel as in the case of high pressure molding.

2) It should be a material which is easily machined.

3) It must be strong enough for all applications.

4) It should have a hard, dense surface that will take a high polish and chrome plate.

5) The material must be stable. That is, it must not grow or change dimension when exposed to 250° F. continuously.

6) It must be very wear resistant at the shear rings and capable of being hardened to produce long life.

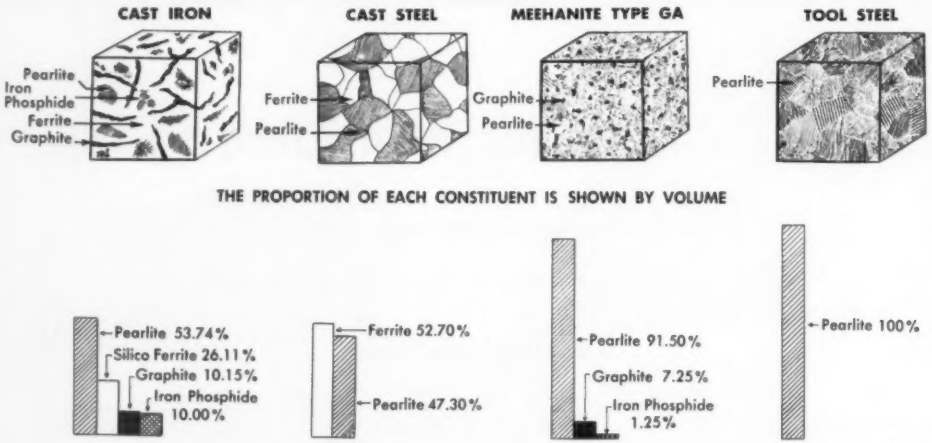
The only material that, to our knowledge, will fit the above conditions is Meehanite cast iron. This metal is a carefully controlled iron that can be heat treated to produce a strong casting and that can be flame hardened at the cut-off rings. It is a castable metal and is similar in composition and structure to tool steel. It contains no free ferrite. Its matrix consists entirely of pearlite except where special wear properties in combination with improved toughness are required; then the casting is made with a base matrix of sorbite or sorbite in combination with pearlite. Figure 1 graphically illustrates the differences in the

* Reg. U. S. Pat. Office
† Engineering Dept., Apex Electrical Mfg. Co.

Table I—Physical Properties of Meehanite Castings

	General Engineering Types					
	GM	*GA*	*GB*	*GC*	*GD*	*GE*
Minimum casting section—in.	3/4	1/2	3/8	1/4	3/16	1/8
Tensile strength—p.s.i.	55,000	50,000	45,000	40,000	35,000	30,000
Modulus of elasticity—p.s.i.	22,000,000	20,000,000	18,000,000	17,000,000	14,500,000	12,000,000
Compressive strength—p.s.i.	200,000	175,000	160,000	150,000	130,000	120,000
Impact strength, Charpy—ft.-lb.	8.0	7.2	5.8	4.5	3.2	2.1
Brinell (as cast)	217	207	196	192	183	174
Thermal conductivity. 50-450°F. B.T.U./hr./sq.ft./in. thickness/°F.	355	350	345	325	300	290
Coefficient of thermal expansion per °F.—From 100 to 1000°F.	0.00000691	0.00000687	0.00000684	0.00000677	0.00000670	0.00000666
Solid contraction, patternmakers' shrinkage—in.	5/32	5/32	4/32-5/32	1/8	1/8	1/10-1/8

FIG. 1-Comparison of Physical Properties of Tool Steel and Three Castable Metals



Properties of Constituents

	Ferrite[a]	*Pearlite*[b]	*Sorbite*[c]	*Phosphide*[d]	*Graphite*[e]
Tensile strength, p.s.i.	52,000	120,000	160,000	None	None
Elongation %	40	25	15	Friable	None
Brinell hardness number	95	197	255	400	Soft

[a] Ferrite is common soft iron. It possesses poor abrasion resistance but is ductile. Being extremely soft, it drags on machining.
[b] Pearlite is a fine laminated structure of cementite and ferrite having excellent elastic and tensile properties. It machines freely, yet gives good wearing resistance.
[c] Sorbite, constitutionally, is the same as pearlite except that particles of cementite are granular. It possesses superior strength and is tough and wear resistant.
[d] Phosphide is a combination of phosphorus and iron. It is a hard and friable substance without strength properties.
[e] Graphite, a form of carbon, is a natural lubricant. Usually present in form of flakes and is responsible for graphite brittleness in cast iron.

Courtesy Meehanite Metal Corp.

compositions and structures of cast iron, cast steel, one type of Meehanite iron, and tool steel. Table 1 lists the more important physical properties of Meehanite castings.

Mold Design

In designing a mold, it is important that the plans call for the two halves—male and female—to be cast as complete units. This will eliminate a lot of fitting of parts together and will also eliminate all gasketing of the steam chambers.

The following discussion covers the basic steps in the design and making of a good production mold. The illustrations used in some cases are elementary but are included to make the story complete.

To build such a mold for a given part it is necessary to know the following:

1) How the wood patterns are designed.

2) How the baked sand cores that are used in the sand mold are designed.

3) What type of mounting means is to be provided on the mold for anchorage to the press bed.

4) How castings are made so that they are steam jacketed without the use of gaskets.

5) How positive stops are designed into the mold.

6) What type of guide bushings are used so that differences in temperature of male and female mold halves will not cause binding of the guides.

7) How the molded part can be ejected from the mold after curing.

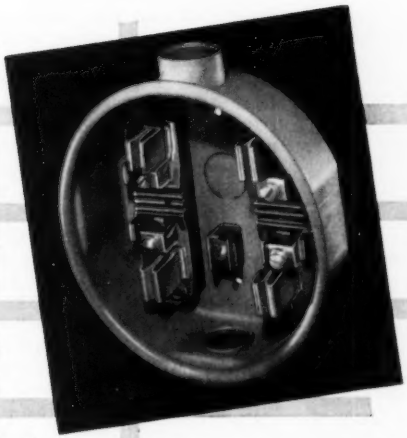
8) How the pinch-off rings are designed and hardened so as to produce a trimmed part from the mold.

9) How the mold can be placed into the press and removed with a minimum of time.

Complete details follow for each step listed above.

1) *How the wood patterns are designed*—Figure 2 shows the wood pattern for the male half of the 12-in. ring used on the automatic washer made for Montgomery Ward Co. This pattern is used to make the complete cavity in the sand mold. Core prints are provided on this pattern for a large plate at the base of the mold and for each slot that will be later used to anchor the mold to the press. The core print cavities in the mold will later be filled with baked cores of the correct design to produce the required casting.

Patterns and core boxes are usually made of white pine, which will hold its shape long enough to make



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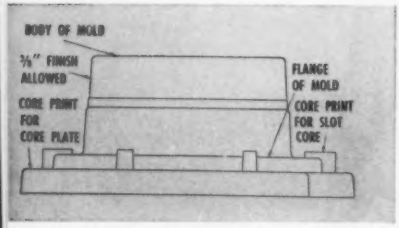


Fig. 2: Wood pattern for male half of mold for making automatic washer ring

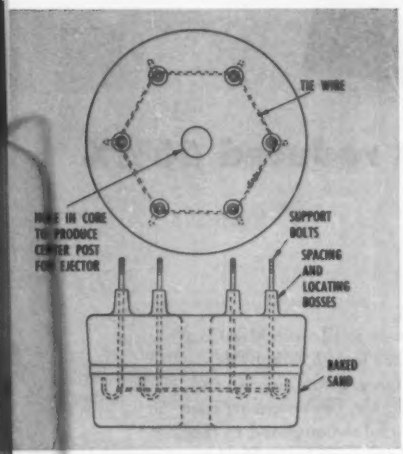


Fig. 3: Baked core for steam chest of male mold, showing anchor bolts used

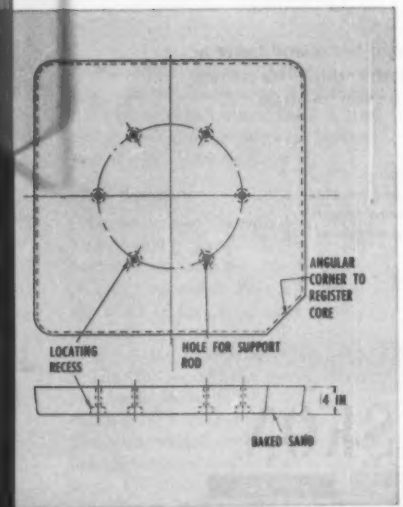


Fig. 4: Core plate for male mold; angular corner registers core in cavity

the necessary castings. The pattern of the actual mold surfaces is made heavy enough to allow for ⅜ in. finish so as to get down to dense metal when machining the mold.

2) *How the baked sand cores that are used in the sand mold are designed*—The core used to produce the steam chamber is of baked sand composition (Fig. 3) and is provided with anchor bolts and spacing bosses. This core is rammed up in a wooden core box of the proper shape with anchor bolts held in position during the time the core is being rammed up. The hole in the center of the core will produce a solid iron post up through the center of the mold. This is used for ejection purposes as explained later.

The core plate (Fig. 4) is made heavy so as to support easily the core shown in Fig. 3. This core plate is provided with holes, to receive the supporting bolts, as well as with locating recesses. These recesses provide proper locating of the steam chest core to the core plate. In addition, they determine the spacing between the core plate and the steam jacket core.

By providing one angular corner on the core plate it becomes impossible to register the core plate into the sand cavity in any but the correct position. Also, by spacing the locating bosses at irregular intervals the steam chest core can be indexed in only one position in the mold. This provision is necessary if there are variations in the steam chest that require accurate angular relation with the mold body. This method makes a fool-proof assembly; the molder can get the cores together in only one—the correct—position.

3) *What type of mounting means is to be provided on the mold for anchorage to the press bed*—The tee slots and pads for the bolts used to clamp the mold to the press bed are cast to the required shape by the cores shown in Fig. 5. A series of these baked sand cores is set into the cavities formed in the sand mold by the core prints on the wood pattern. In this case eight are required. No machining is necessary on the slots, provided ample clearance is allowed for casting variations. About ¼ in. should be allowed on the width of the slot over and above the bolt diameter. The face of each pad is machined to provide a flat surface for the bolt head and washer.

4) *How castings are made so that they are steam jacketed without the use of gaskets*—The cores described above are assembled into the sand mold produced by the wood pattern as shown in Fig. 6.

The entire body of sand in the cope and drag is either baked to dry the sand or else is skin dried to a reasonable depth with a gas flame prior to the assembly of the cores.

The mold is cast inverted in the drag half of the mold. The cope is clamped to the drag and serves to hold the cores down in place against the buoyant effect of the liquid metal. The cope also contains the sprue and runner for feeding metal to the mold. No risers are necessary when casting Meehanite iron.

By casting the mold half in an inverted position it will be seen that all loose sand and all gas formed will rise to a position along the bottom of the core plate. Defects in this area are no problem because the base of the mold is usually 2 in. or more thick with finish allowed on the bottom surface.

After the casting has cooled it is

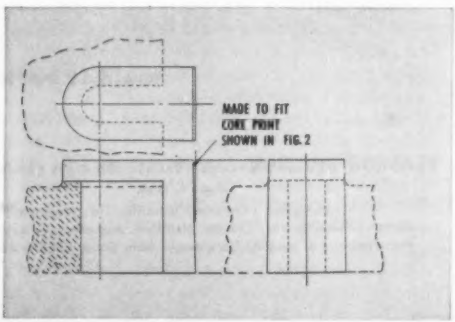


Fig. 5: Core design for producing cast tee slots in edge of mold. These cores set into cavities formed in sand mold by core prints in pattern

necessary to remove the core and anchor rods through the round holes in the bottom of the mold. These holes are then tapped and plugged with Meehanite iron pipe plugs. The plugs are machined off level with the bottom of the mold at the same time that this surface is finished.

5) *How positive stops are designed into the mold*—The molds considered in this article are of the semi-positive type. That is, the mold closes and pinches off at the lower end of the molding before the two halves of the mold hit the positive stops. Stops are necessary to maintain accurate dimensions of the molded part.

Figure 7 illustrates the design of one of the stops. The guide bushing is pressed into a pad in the upper half of the mold. The hollow in the upper mold half is obtained by use of a sand core placed in the mold in a manner similar to that employed to produce the tee slots. The lower stop pad is provided with a high carbon tool steel clamp plate and stop shims. These shims furnish a convenient means for making slight changes in the mold closure if necessary. The clamp plate material can be purchased in the ground condition and is used without hardening.

6) *What type of guide bushings are used so that differences in temperature of male and female mold halves will not cause binding of the guides*—The simplest way to hold the two halves of the mold so that the main center lines always coincide is by the use of elongated bushings and round guide pins. Either the four-pin or three-pin design shown in Fig. 8 can be used. A long mold can be properly guided by three large pins, whereas a square or round mold should have four pins. It is important in all cases that the two center lines under control be at 90° to each other.

The centerline *ab* of the lower mold that contains the ground guide pins must always coincide with the centerline *AB* of the upper mold that contains the elongated guide bushings, regardless of whether one mold half is hot and the other cold, or both are hot, or both are cold. The same is true of centerlines *cd* and *CD*.

Figure 9 shows a set of standards set up for pins of various diameters for different size molds. This chart covers all main dimensions for pins and elongated bushings $\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{4}$, and $2\frac{1}{2}$ in. in diameter.

7) *How the molded part can be ejected from the mold after curing*—

(*Continued on p. 92*)

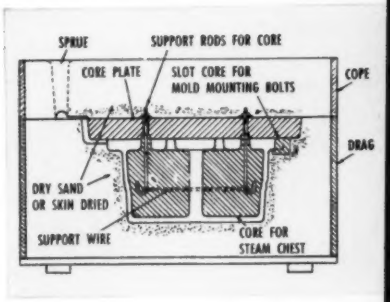


Fig. 6: Assembly of core and core plate in mold prior to pouring casting metal

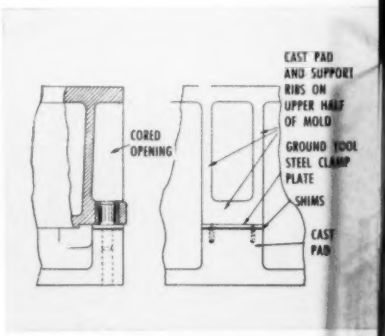
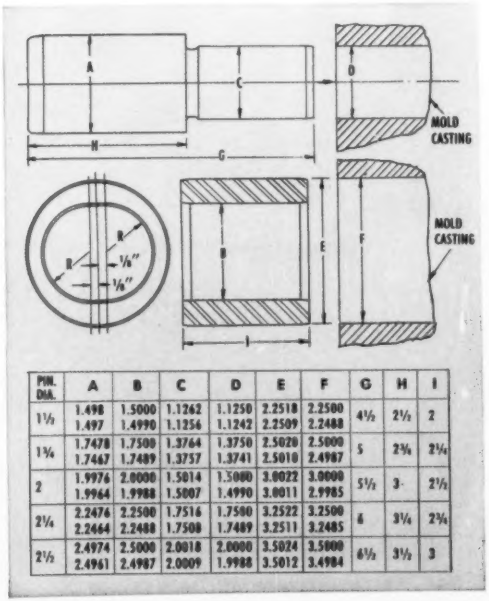


Fig. 7: Design of positive stop, cast integral with mold. Tool steel plate on lower pad can be shimmed as needed



PIN DIA.	A	B	C	D	E	F	G	H	I
1½	1.498 1.497	1.5000 1.4990	1.1262 1.1256	1.1250 1.1242	2.2518 2.2509	2.2500 2.2488	4½	2½	2
1¾	1.7478 1.7467	1.7500 1.7489	1.3764 1.3757	1.3750 1.3741	2.5029 2.5010	2.5000 2.4987	5	2¾	2¼
2	1.9976 1.9964	2.0000 1.9988	1.5014 1.5007	1.5000 1.4990	3.0022 3.0011	3.0000 2.9985	5½	3	2½
2¼	2.2476 2.2464	2.2500 2.2488	1.7516 1.7508	1.7500 1.7489	3.2522 3.2511	3.2500 3.2485	6	3¼	2¾
2½	2.4974 2.4961	2.5000 2.4987	2.0018 2.0009	2.0000 1.9988	3.5024 3.5012	3.5000 3.4984	6½	3½	3

Fig. 9: Chart of dimension standards for pins and elongated bushings of five diameters as tabulated

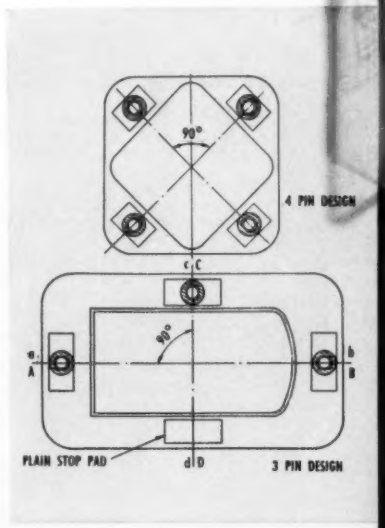


Fig. 8: Design of molds using either three or four guide pins and bushings

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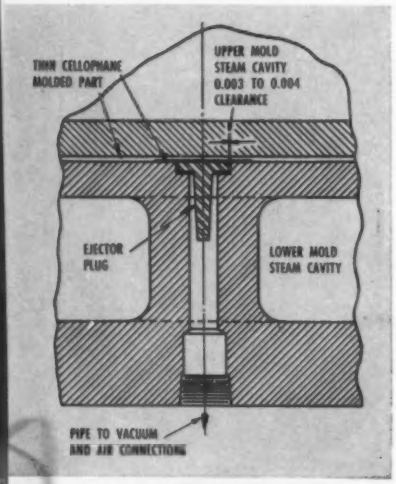
THIN CELLOPHANE MOLDED PART
UPPER MOLD STEAM CAVITY 0.003 TO 0.004 CLEARANCE
EJECTOR PLUG
LOWER MOLD STEAM CAVITY
PIPE TO VACUUM AND AIR CONNECTIONS

Fig. 10: Ejector plug makes it possible to blow molded parts from male mold

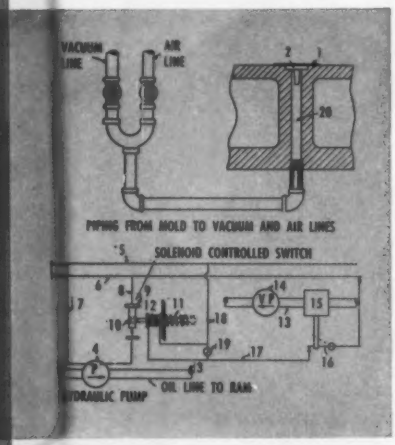

Fig. 11: Diagram of vacuum and air connections and of electrical interlock

Some parts, due to their gradual contour and large draft, do not require means of ejection. Other parts, with drafts down to the minimum of 1° on a side, must be ejected with force.

All the molds used at Apex have been provided with means for blowing the molded parts from the male mold by means of air. The actual mold design with ejector is shown in Fig. 10. The complete design of this type ejector is covered in U.S. Patent 2,512,535, issued June 20, 1950, to the Apex Electrical Mfg. Co. License to use this design can be obtained from Apex.

Figure 11 shows the connections of the mold to the vacuum and air pressure lines, together with the interlock to protect the mold in case the operator has not set up properly.

It is important that the mold parts be prevented from closing or being brought into molding relation in the event that an operator inadvertently omits to place cellophane strip 1 over ejector plug 2. Means for providing this protection are illustrated in Fig. 11.

The hydraulic line communicating with the press ram is indicated at 3, and a liquid pressure pump in the line is indicated at 4. The type of pump shown can be started and stopped when pressure is desired or discontinued, but a continuously operating pump could be employed, with a valve in the line ahead of it.

Two main electrical power lines are indicated at 5 and 6, and a line 7 extends from lead 5 to one terminal of the pump motor. The motor is energized when a circuit is completed through line 8. A pushbutton switch 9 can complete the circuit through line 8, the button having an opening to receive a pin 10 which, when in the opening, prevents the switch from being closed.

Spring 11 normally holds pin 10 out of contact with the pushbutton. Since pin 10 extends and forms the core of a solenoid 12, the pin will be forced to the left when the solenoid is energized and will engage the pushbutton to prevent the switch from being closed.

The vacuum line which connects with passageway 20 of the lower mold is indicated at 13. When the vacuum pump 14 is operated, it creates a partial vacuum in the passageway. A switch operated by air pressure differential includes a housing 15 which provides a chamber having a snap-acting diaphragm forming one wall. This chamber is connected with vacuum line 13. When the chamber pressure is reduced to a predetermined value, the diaphragm will snap and open switch 16. This switch is in the solenoid circuit. When this circuit is completed, energizing the solenoid, the pushbutton switch cannot be operated to start the pump or to open a valve controlling liquid flow through line 3 to the ram of the press. If the operator has placed a strip of cellophane over the ejector plug in the mold, a vacuum will be drawn and switch 16 will be opened, de-energizing the solenoid and releasing the pushbutton. Then the pushbutton can be used to operate the ram of the press by starting the pump or opening a valve.

The capacity of the vacuum pump relative to the low pressure required to open switch 16 is such that a sufficient reduction in pressure cannot be effected in line 13 unless the cellophane strip is in sealing position over the ejector plug. Therefore, unless such a seal is provided by the positioning of the cellophane strip by the operator, thus preventing entry of resin to the ejector plug, the mold parts cannot be brought together or into molding relation. As an additional safeguard, a red warning light 19 is connected to lines 17 and 18. When switch 16 is closed, the light will be lit, indicating that a seal has not been produced or that the operator has failed to place the cellophane strip over the plug.

After the molded part is cured, and before opening the mold, the vacuum is cut off and air pressure is applied to passageway 20. The

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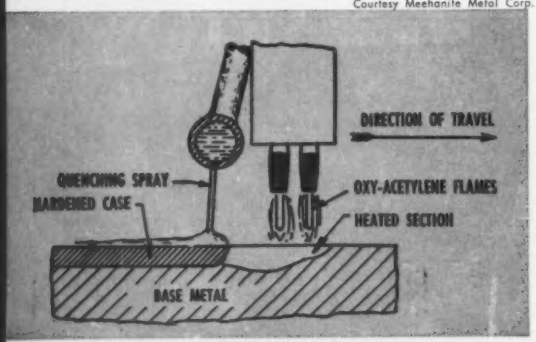


Fig. 12: Typical torch and quench setup used for flame hardening Meehanite castings. This process is used to harden mold pinch-off rings

mold is then opened. The molded part leaves the male mold with the female acting as the back-up support. Then the part shrinks away from the female mold and comes free. The use of positive ejector plugs is made possible because the strip of cellophane seals off passageway 20 and prevents the liquid polyester resin from being sucked into this opening by the vacuum. If this provision were not made, the liquid resin would prevent operation of the ejector plug.

8) *How the pinch-off rings are designed and hardened so as to produce a trimmed part from the mold* —As explained at the beginning of this article, one of the reasons for the use of Meehanite cast iron in these molds is that the material can be hardened. The pinch-off rings are flame-hardened (Fig. 12) in the areas surrounded by dotted lines in Fig. 13. This process produces a ring that is very wear-resistant. Our production experience with these flame-hardened rings is still limited, but a great number of parts have been molded, and as yet the rings have not worn to a noticeable extent.

The pinch-off rings can be either angular or 90° in contour. The angular rings produce more of a crushing action whereas the 90° rings cut freely. The bulk of our experience has been with the angular type rings; with them, damage will occur to the cutoff steps if the molds are not precisely in line when the press is closed. This is because the lead on the angular pinch-off acts as a centering medium.

9) *How the mold can be placed into the press and removed with a minimum of time*—It is necessary that at least four tapped holes be provided near the edge of the lower mold as shown in Fig. 14 so that set screws can be placed as shown.

The space under the mold obtained by screwing the set screws down provides clearance for the forks of the lift truck when the mold is placed in the press or removed. After the mold is placed in the press, it is lowered to the press bed by backing off the screws. The set screws are then removed so that they are not in the way.

A cross-section of a completed mold is illustrated in Fig. 15, and the mold in use is shown in the accompanying photo.

Surface Treatment

The subject of mold design would not be complete without some mention of the surface treatment of the mold. As in high pressure molding, the surface must be good. Hand polishing should be employed to remove all scratches. Good molding dictates that the surface should then be hard-chrome plated. A chrome-plated mold with good surface finish does not require the use of a mold release agent to insure easy removal of the cured part. However, good molded pieces can be obtained with polished but unplated surfaces if a mold release agent is used.

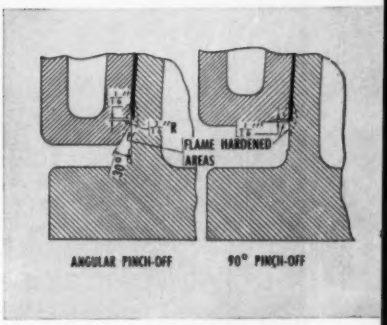


Fig. 13: Two types of pinch-offs, showing areas of the Meehanite metal which have been flame hardened

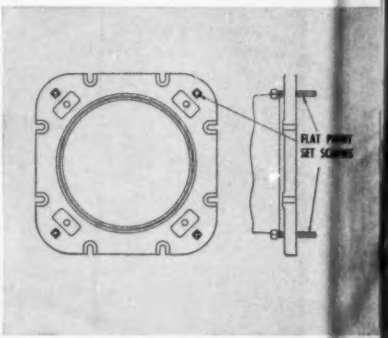
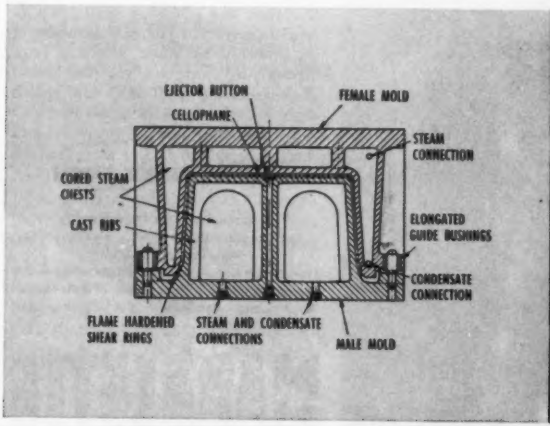


Fig. 14: Set screws run through tapped holes near edge of lower mold permit raising mold to clear lifting forks



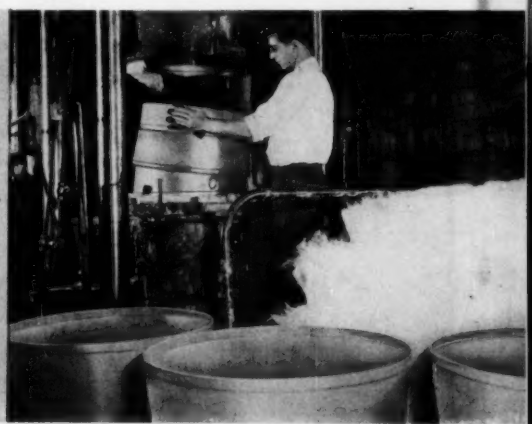
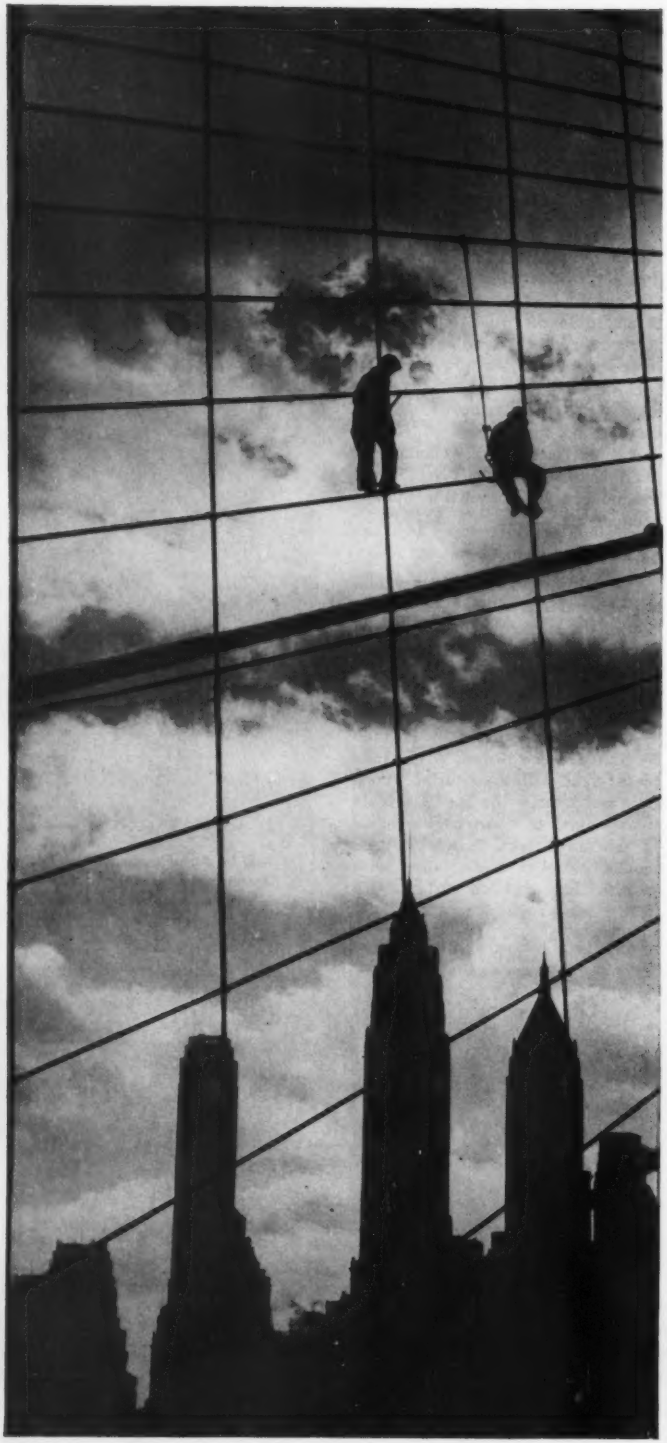


Fig. 15: Cross-section of completed male and female mold halves closed, with cellophane strip in position to seal the ejector plug and prevent entry of resin into the air and vacuum passageway. Photo shows operator removing washer ring from male



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Static Dust Collection On Plastics

by P. C. WOODLAND† and E. E. ZIEGLER†

A new technique for obtaining and observing static dust deposits has been developed. This technique has been used to determine the effect of several variables on the pickup of dust by polystyrene and other plastics. The mechanism by which high static charges are created on plastic moldings, and the sign, magnitude, and distribution of these charges are discussed. Several possible destaticizing treatments for plastics are evaluated.

THE need for relief of the dust collecting tendencies of polystyrene has been realized for years. Back in 1933 a colorful display at the Chicago World's Fair had to be removed because of excessive dust attraction. Since then, attention has been drawn on many occasions to difficulties of a similar nature, to plastic moldings on exhibit in commercial, industrial, and showroom displays, and in actual use in a wide variety of conditions, all of them soiled in varying degrees by the irregular dust patterns which had formed on their surfaces.

In many such instances rather inexpert attempts to wipe the dust off with dry cloths served primarily to create additional static charge, and thus resulted in still more dust and lint being attracted to the moldings. Another undesirable result of such "cleaning" procedures was the surface scratching that often resulted from rubbing the small but often hard and gritty dust particles across the plastic surfaces which had been highly polished.

In the past the testing of polystyrene's dust collecting ability has invariably taken one of two forms—that of waiting for natural dust deposits to build up during an extended period of shelf storage, or that of attempting accelerated laboratory evaluation by correlating its surface resistivity, the attraction of bits of paper, or the antics of a nearby gold-leaf electroscope with actual dust deposits.

Obviously many variables affect the natural deposition of dust. Such things as humidity, type and amount of dust, and direction and velocity of wind causing movement of dust are all normally uncontrolled but are very important factors in dust collection. These, added to the considerable time delay, make testing by natural dust deposition a practical impossibility.

Correlation of surface resistivity with dust deposits has not been complete because of lack of information and because of the fact that polystyrene's (and for that matter, other plastics') surface resistivity remains exceedingly difficult to measure; it is sometimes calculated in an approximate fashion from other available data. Furthermore, it is very confusing to observe by means of an electroscope the peculiar combinations of positive charges, negative charges, and the apparent absence of any charge, that sometimes appear on different areas of plastic moldings, and to watch dust collect under all three conditions.

Preliminary experimental work and the factors mentioned in the foregoing brief analysis made it obvious that before much progress could be made toward a solution of the problem, a uniform synthetic dust and a fast, reproducible, and easily controlled test method had to be developed.

Dust

The great variation which occurred from one sample of "natural dust" to another had previously forced the National Bureau of Standards and the American Society of Heating and Ventilating Engineers to adopt a synthetic dust for their work on filters and air cleaners. They standardized on a mixture of 80% by weight of fine sifted Pocahontas ash and 20% of finely divided carbon black. This mixture worked very well on polystyrene as far as well patterned deposits were concerned, but it had the defi-

Fig. 1—Distinct, unusual patterns of special fluorescent dust on polystyrene wall tile photographed in "black" light

* Reg. U. S. Pat. Office
† Plastics Technical Service, The Dow Chemical Co.

nite limitation of not photographing well by conventional techniques. Since permanent records were vitally necessary to this program, good clear photographs were considered indispensable. There was a notable lack of contrast even when this artificial dust was shown on plain white moldings. When it deposited on pieces of mottled grey, it was practically invisible.

The synthetic dust that was finally decided upon contained a sizeable percentage of finely divided fluorescent pigment, as well as sifted Pocahontas ash and carbon black. This mixture proved to be entirely satisfactory in that it was attracted to and held by polystyrene moldings in typical patterns and in sufficient amount to show quite well in white light, and to glow very distinctly in "black" light. Thus it became possible to use moldings of any color, plain or mottled, because these colors remained invisible under "black" light while the synthetic dust fluoresced in the shape of brilliant patterns.

Photographing such patterns in "black" light by conventional technique resulted in prints of a reversed image; that is, dust patterns showed up as light areas on a dark field. In order to picture dust as dark patterns on a light field it was found advisable to use Eastman direct positive film and a yellow-orange filter to absorb the bluish fluorescence of some plastic samples, and thus give better color contrast. By double developing this film it was possible to obtain pictures of natural appearance by conventional printing on regular photographic paper. The suitability of this technique and the brilliance and detail of the resulting black and white prints can be judged from the photographs which follow in this report. It should be remembered that in these prints the *dust* shows up *dark* and the plastic *moldings* show up *light* (see Fig. 1, p. 95).

Test Chamber

An insulated oven measuring approximately 3 by 3 by 4 ft. was constructed for this work. Inside the oven and in one corner a slow speed blower was placed. This unit remained in constant operation and, together with thermostatically controlled heating elements, served to maintain constant temperature and uniform air flow throughout the test chamber. Trays, placed in the bottom of the oven and filled with a desiccant or water, were used to obtain a wide variation in humidity within the enclosure. A small centrifugal blower was mounted on the outside of the chamber. During tests a weighed charge of dust was poured into the intake side of this blower and was thereupon discharged into the chamber in very turbulent form to create a cloud of dust within the enclosed experimental area.

Test Specimens

Polystyrene wall tile measuring 4¼ in. square were used wherever possible for this test work. They were readily available in a wide variety of colors, and they presented a highly polished area of sufficient size for detailed examination. In addition, tile could easily be molded from plastic materials other than polystyrene. Thus, many comparative and experimental materials could be molded into pieces of the same size and shape, and under conditions sufficiently identical to allow for valid and direct comparison of test results.

Fig. 2—Photo of branched dust patterns which show on some untouched moldings

These tile (or moldings of similar size) were always mounted in a vertical position in the test chamber in order that dust deposits might depend as completely as possible on static attraction, not on gravitational settling.

Great care was exercised throughout this work to prevent any contact from being made with the plastic test surfaces. Thus, the tile were always handled carefully from their edges in order that fingerprints might not interfere with the dust patterns. Reference is made later in this report to "untouched tile," indicating that tile were used just as they came from the molding machine, their surfaces neither touched by hand nor rubbed with cloths nor treated with polishing agents.

Typical Dust Patterns

Static dust patterns and snowflakes have one thing in common—no two are alike. There are typical or characteristic formations that can be distinguished, however, and it will be advantageous to point out here three types of dust patterns which appear most frequently on plastics.

Type 1. Branched Patterns (Fig. 2)—These appear characteristically on some *untouched* moldings. Sometimes referred to as "crowfeet," these patterns range from a simple design of a sandbur to elaborate branched systems covering several square inches. These patterns sometimes exist with dust lines showing on a dust-free background, and on other occasions show up as fine dust-free lines on a dust-covered background. They exist at random, unaffected by plastic flow.

Type 2. Uniform Smears (Fig. 3, p. 98)—These are areas of various sizes in which the static charge, and hence the deposition of dust, is quite uniform; that is, without any unusual or irregular patterns.

Type 3. Spots and Streaks (Fig. 4, p. 98)—These are sometimes found bearing a relation to plastic flow but are more often distributed at random. They often show distribution of small positive or negative islands scattered in a field of the opposite charge.

Effect of Coloring Agents

Twenty-three different colors of polystyrene wall tile have been tested to date in an effort to determine the effect, if any, of various coloring agents on dust collection. It is obvious from the photographs of dusted tile, (see Fig. 5, p. 104) that coloring agents, as such, have no effect on the amount of dust collected. It is possible that they have a slight effect on the types of patterns produced on untouched tile, but this is rather indefinite and appears to be

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It is easy to understand, when comparing these tile under visible light and "black" light, how a false impression can be created to the effect that some colors collect more or less dust than others. In visible light, color contrast is necessary before the dust shows up distinctly. In

Fig. 3—Uniform smear dust pattern

black light the fluorescent dust shows up in brilliant patterns against a neutral background, regardless of the color of the plastic. Thus in white light, grey dust shows up almost not at all against grey tile, and it becomes almost indistinct against the camouflaging of light-colored mottled tile. However, in black light the amount and pattern of dust can be examined with ease, and it has been noted that considerable amounts and various patterns of dust have collected on all colors of polystyrene tested to date. This includes a special black formulation containing over 0.5% of carbon black, as well as a special metallic color containing 1% finely ground copper.

It is not surprising to note the conventional deposits of dust on the metallic colored polystyrene sample. The fact has been established on previous occasions that each small particle of metal included in such colored samples is surrounded by a layer of polystyrene, and hence is not in contact with neighboring particles but is insulated from them much as a series of islands separated from each other by water. It has been proved experimentally that as much as 20% of finely divided metal particles can be incorporated in polystyrene without significantly changing its surface resistivity. With the foregoing in mind, it would appear practically impossible to alter polystyrene's static dust attraction by the incorporation of fillers or coloring agents.

Effect of Lubricants

The lubricants investigated can be divided into two groups; first, those incorporated in or on the individual granules and, second, those used on mold surfaces.

To investigate the first group, unlubricated polystyrene was compared with several internally and externally lubricated formulations. Typical mixed dust patterns of small branched areas, uniform smears, and individual spots were visible all over the unlubricated polystyrene, which was injection molded against steel surfaces previously washed with carbon tetrachloride. Internally lubricated polystyrenes in both clear and opaque colors showed heavy dust patterns containing large, well defined branched patterns and large, uniformly smeared areas. Polystyrenes externally lubricated with several waxes and with metallic stearates showed very much the same thing.

Thus, conventionally lubricated polystyrene is just as bad from the dust collection standpoint as unlubricated material. It appears that a limited amount of lubricant on the surface area of a molding actually facilitates formation of large branched patterns. It also appears that such a lubricant becomes effective in eliminating dust pickup only when it is present on the surface in such concentration as to cause surface blemishes.

The effectiveness of mold lubricants in reducing dust pickup was also found to be inconsequential when they were used in reasonable or practical amounts. Only when they formed a relatively heavy layer on the surface of the molded piece and thus seriously impaired its appearance did these lubricants become effective in reducing dust deposits (Fig. 6, p. 169). Materials used in this work included zinc stearate as well as five commercially available mold release agents.

An attempt was made to mold unlubricated polystyrene with a complete lack of mold lubricant or contaminating film, that is, against clean metallic surfaces, in order to determine the effect on dust patterns. When carbon tetrachloride was used to wash thoroughly the chromium-plated mold surfaces, the absence of large branched patterns on the molded tile was noticeable. Only a few relatively small branched areas developed, most of these being concentrated around the edges.

Realizing that carbon tetrachloride might well not have produced a *chemically clean* metallic surface, an abrasive polishing agent was also used. The first shots off the mold in this condition collected more dust than they did before the mold was polished. Of course, it is not known whether the metallic surfaces were "clean" or not, but the evidence indicates that using a mold that is at least cleaner than would be practical in commercial production is not beneficial as far as dust pickup is concerned.

To check the effect of molding polystyrene against a relatively clean and well grounded mold surface, a sheet of stainless steel was specially prepared by polishing it to a bright gloss and immersing it in aqua regia for 60 seconds. Unlubricated polystyrene was compression molded against this special plate, and the metal-polystyrene laminate was then removed from the press. Electrometer tests indicated the presence of a definite but very mild charge which was completely eliminated by the use of a destaticizer on

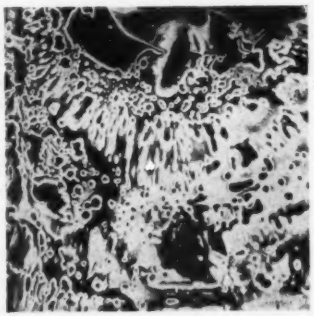
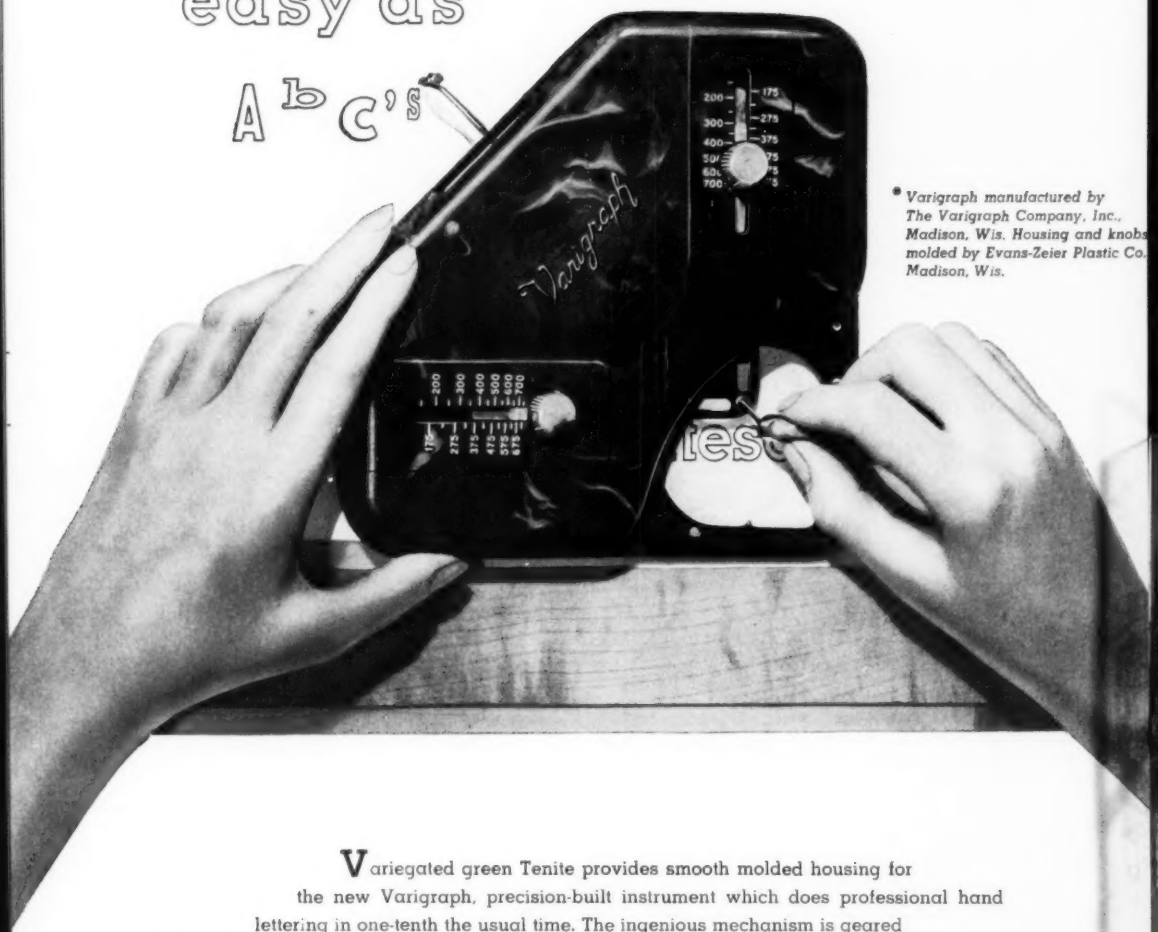


Fig. 4—Spot and streak dust pattern

the exposed surface of the polystyrene. After the stainless steel was grounded, the polystyrene plate was removed from it. Immediately a very high charge was detected on the newly exposed surface of the polystyrene, indicating definitely that it is during the ejection of a molding that a large part of its static charge is created, and that grounding the

easy as A b c's



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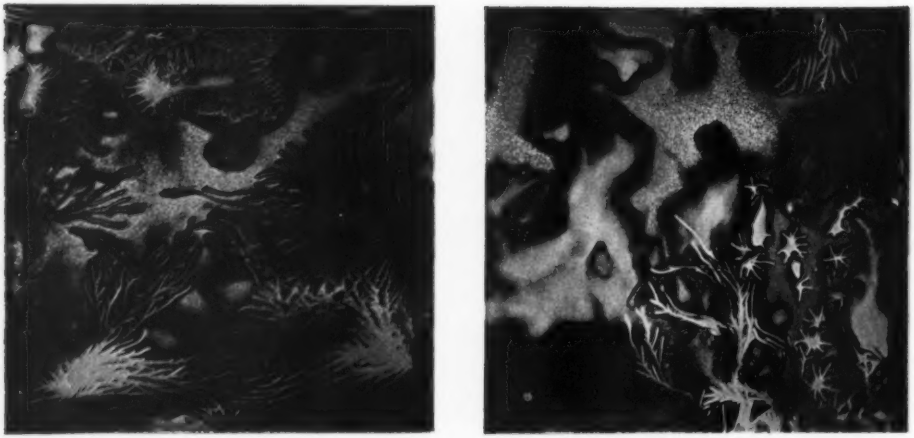

Results of two-color dusting method. Polystyrene tile has been dusted with two-color fluorescent powders and photographed in "black" light. Red areas are negative, green areas positive. Tiles as whole show negative charge. Red dots indicate gate position

mold metal is of no value, at least with molds no cleaner than those in daily use.

A possible explanation for these observations is as follows:

1. Molding clean polystyrene against a relatively clean mold allows for quite intimate contact between the polystyrene and the metal. Regardless of what static charge is built up before and during the molding process, it appears that a considerable charge is created during ejection when separation of the plastic molding from the metal cavity takes place. The very high surface resistivity of clean polystyrene prevents the charge from leaking off and results in a dust pattern comprised of many small spots, uniform smears, and irregular patterns, but few if any branched patterns.

2. Molding conventionally lubricated polystyrene against either clean or lightly lubricated metal results in certain areas of the molding being coated with a thin film of lubricant and other areas being in relatively intimate contact with the "clean" mold metal. Separation of the two results in a high charge being built up on the *relatively* clean areas, which then tends to leak off in the typical branched discharge pattern on the *relatively* "dirty" areas having lower resistivity by virtue of the lubricant present on the surface.

3. Molding excessively lubricated polystyrene results in the formation of a protective layer of lubricant on nearly the entire surface of the molding. This in turn has two probable effects: it prevents the creation of high static charge during ejection because it prevents intimate contact, and also its lower surface resistivity over the entire area results in a more uniform discharge of what little charge may have been built up.

The theoretical explanation outlined above is borne out by the following experience. An untouched black tile was taken from the mold and its highly polished surface was given a very light brisk polishing with a clean sheet of facial tissue in such a way as to create a high static charge. When dusted, this tile showed a very heavy concentration of dust in the exact pattern created by the rubbing, with a noticeable absence of branched patterns. Another black tile was rubbed briskly with zinc stearate on the facial tissue and a large branched pattern developed on a relatively uniform background.

Effect of Molding Method and Size

Several sizes and shapes of polystyrene moldings were checked for the effect that they might have on dust collection. Compression and injection moldings were made, ranging in thickness from 0.035 to 1 in., and from a few square inches in area to sheets measuring 24 by 30 inches. The results on all were essentially the same—no relief from static dust and practically no significant differences from one sample to another. Branched patterns, small spotted areas, and large uniform smears appeared singly or in combination on all the samples.

An extruded strip of clear polystyrene approximately 8 in. wide and $\frac{1}{8}$ in. thick was taken as it came out of the extruder and was dusted as soon as it reached room temperature. No branched patterns were visible on any portion of this extruded strip, only streaks of dust primarily in the direction of plastic flow.

Because of the presence of branched patterns on injection and compression molded pieces and the lack of such patterns on extruded strips, the fact was indicated again that a large part of the total static charge is created as the chilled molding is separated from the mold. It was also indicated that branched patterns show the existence of relatively high static charge, and that the presence of smeared or spotted areas indicate a static charge of lower order.

The creation of high static charge during ejection of a molding was well illustrated by results obtained from casting a toluene solution of polystyrene on a glass plate. No appreciable charge existed on the polystyrene film (measuring 0.002 by 4 by 6 in.) as long as it remained in intimate contact with the glass

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plate on which it was cast. However, when it was stripped off, a charge was created that could easily be detected by means of an electrometer and that, when dusted, showed very definite spotted and streaked patterns.

Some interesting work was done with specially polymerized billets that bears out the same conclusion. Several small blocks of unlubricated material were made by polymerizing styrene in metal containers. After the polymerization was complete, the metal was carefully removed in order that the plastic inside might not be contaminated by fingerprints. When dusted, these billets showed typical patterns in those areas that touched the metal in the latter steps of the operation. There was no dust visible on the top surface of each billet where metal contact was never made.

To develop this one step further, it should be noted that a variety of molding surfaces will cause an appreciable static charge to build up. Dust patterns of varying intensities but of definite character were noted on polystyrene molded against tool steel, chrome plate, stainless steel, magnesium, bronze, zinc, tin, lead, and copper.

To sum up, it appears that the size and shape of a molding have no practical effect on dust collecting tendencies, and that the method of fabrication has an effect only on the type of pattern which results, not on the total amount of dust collected. It also appears that the separation of molded polystyrene from a dissimilar material, particularly a metal, creates a relatively large and important static charge which, because of its inability of leak off, results in dust collection. It has been clearly shown that the charge and the resulting dust pattern bear no positive relation to plastic flow in the molding. This is obvious from the fact that branched patterns appear indiscriminately in compression moldings where little or no plastic flow exists. It is clearly pictured in several of the prints shown in Fig. 5.

Effect of Humidity

The idea has been expressed many times that polystyrene's dust collecting tendencies disappear above a certain relative humidity —usually around 40 percent. Recent tests indicate that although less dust accumulates in the humid summer months, it is not because of any significant change in *polystyrene's* electrical characteristics. Proof of this is the fact that dust collection on polystyrene is little affected after prolonged "soaking" at very high humidity. Dry dust adheres to the tile in typical amounts and patterns, even after the tile have been stored at 95% relative humidity for one month.

Soaking the tile in water produced more definite results. One hour was sufficient to cause removal of the branched patterns and reduction of the remaining spots and smears to a marked extent. Eight hours reduced them still more, and 24 hr. removed them all, probably because the charge leaked off slowly through the water.

It is thought that the answer to the lack of static dust accumulation in humid weather lies primarily in the fact that *humid dust* will not stick to a polystyrene molding, ever when the latter is well charged and is tested in air of very low relative humidity. To check this, several untouched tile were treated at approximately 20% relative humidity with dust purposely kept at low humidity. Immediately thereafter several similar tile were treated with dust which had been exposed to 95% relative humidity for several days. Figure 7 (p. 174) shows that usual amount of dust was held on the tile treated with dry dust and that only very faint patterns are visible on the tile treated with "wet dust." It is thought that these faint patterns might have resulted from the small amount of dry dust which remained in circulation in the oven from the preceding test.

It was thought unnecessary to determine the critical relative humidity above which the previously described synthetic dust would not deposit on polystyrene, for the obvious reason that individual dusts would vary widely in moisture absorption characteristics, and accurate information on one or two specific dusts would add little to our general knowledge of the problem. However, it would be logical to assume that the more hygroscopic dust particles in the summer air (such as those of the cellulosic variety) would not collect on plastics to any appreciable extent, but that the visible dust which does collect is non-hygroscopic in nature (such as some of the fly ash and silica types).

It can definitely be pointed out that difficulties with static dust collection on plastics should be much less severe in the humid summer months than in the much drier winter months, but that the basis for this lies not with the plastic but with the dust itself.

Table I—Surface Resistivity of Plastics

Plastic material	*Surface resistivity*[a] *At 30% RH*	*At 60% RH*	*At 90% RH*	*Remarks*
	Ohms	*Ohms*	*Ohms*	
Polystyrene	$>5 \times 10^{16}$	$>5 \times 10^{16}$	$>5 \times 10^{16}$	Known to be 10^{19} to 10^{21}
Polyethylene	$>5 \times 10^{16}$	$>5 \times 10^{16}$	3×10^{10}	Known to be lower than polystyrene
Polymethyl methacrylate	$>5 \times 10^{16}$	$>5 \times 10^{16}$	7×10^{15}	Known to be lower than polystyrene
Ethylcellulose	$>5 \times 10^{16}$	$>5 \times 10^{16}$	3×10^{15}	Usually considered lower than methacrylate or polyethylene; dependent upon plasticizer
Vinyl-vinylidene chloride copolymer	$>5 \times 10^{16}$	3×10^{15}	2×10^{11}	
Urea	$>5 \times 10^{16}$	9×10^{14}	2×10^{12}	
Nylon 610	$>5 \times 10^{16}$	10^{14}	10^{13}	
Melamine	4×10^{15}	10^{14}	10^{13}	
Phenol-formaldehyde	7×10^{14}	5×10^{14}	2×10^{13}	
Paper	3×10^{13}	10^{11}	3×10^{9}	

[a] According to Von Hippel

Destaticizing Treatments

Radioactivity—Suggestions regarding the use of radioactive materials to alleviate polystyrene's dust col-

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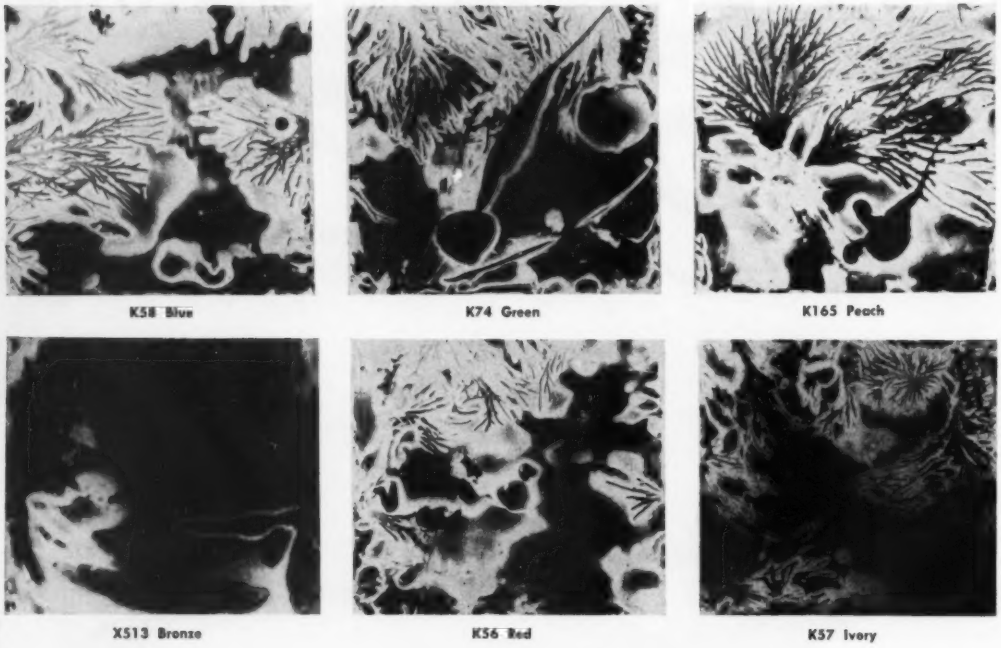

Fig. 5—Dust patterns on colored polystyrene tiles showing effect of coloring agents on dust collection

lecting tendencies have been made on several occasions. These possibilities were considered from two standpoints—treatment of finished moldings by ionization, and treatment of granules or moldings by incorporation of special ingredients. Some experimental work was undertaken in each of these fields.

Several wall tile were exposed for 15 min. to the radiation of two Ionotron bars placed 2 in. away. The alpha radiation emitted by the radium salt in these bars produced an ionized gas layer that so effectively discharged the polystyrene moldings as to eliminate, at least for the time being, all dust patterns. The fact that this treatment eliminated the difficulty is proof that dust collection on polystyrene is due entirely to static electricity, not to mechanical adhesion of dust to viscous surface contaminants as has been suggested.

Except for the slight occupational hazard of operators suffering from excessive exposure to such radiation, this treatment appears very interesting and might find practical use, particularly where elimination of the elaborate branched patterns is of primary concern, and where subsequent handling would likely be of such a nature as not to recharge the moldings excessively. The chances are that the branched patterns, once effectively eliminated, would never reappear unless a very vigorous rubbing were administered under ideal conditions.

This treatment, although fast, simple, and clean, is not permanent, however. Removal of the moldings from this radiation is naturally followed by loss of the ionized gas layer. This means that a static charge can then be built up on the moldings by any one of several means, such as handling, rubbing, wiping, dusting, or in fact, by the natural movement and settling of dust particles in the air. In all likelihood this would result only in the creation of rather mild and general smears, not in elaborate and particularly objectionable branched patterns.

The possibility of incorporating radioactive materials in or on the polystyrene has been given serious consideration. It is well known that both the alpha and beta radiations are effective within a very short range at best. It follows, therefore, that such rays emitted from the inside of any molding would be relatively ineffective near the surface of that molding. It is only the surface ionization which need be considered since that is the only portion which could be effective. Because of this factor, as well as the considerable cost of radioactive elements, it would appear entirely impractical to incorporate such elements throughout the polystyrene. Rather, it would seem more advantageous to apply these elements as a surface coating to the finished molding.

Three materials might be considered as possibilities for such radioactive treatment:

Carbon 14—It is thought that because of the very light nature of these particles and the fact that they do not ionize so well, considerably more of this material would be required than of the other available elements. This material would be relatively unavailable in such quantities and, in addition, would be very expensive.

Uranium oxide—This material would have a rather long half-life but, because of the greater quantity

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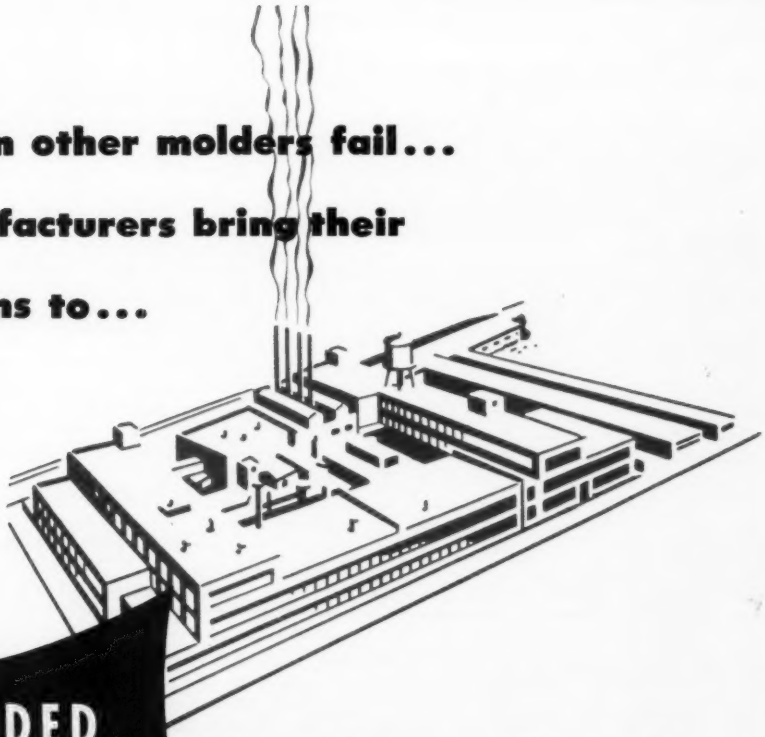

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Table II—Properties of Commercial Destaticizers

Product	Polishing required	Flammable	Tendency to smear	Effectiveness: At once[a]	Effectiveness: No of rubbings[b]	Effectiveness: No. of washings[c]	Approximate price—$/gal.	Application
Glim[d]	Little or none	No	Almost none	E	Over 12	0	0.10	1 to 2% water solution
4% Carbowax; 1% Tergitol in water	Some	No	Slight	E	10	0	0.15	As made up.
Dust-free cleaner	Very little	No	Very little	E	Over 12	0	1.00	As received.
1% Armac T; 1% Tergitol in water	Some	No	Slight	E	5	0	0.10	As made up.
D-Stat B	Little or none	No	Very little	E	Over 12	0	1.75	As received.
Logostat R-2018	Little	Yes	Very little	E	Over 12	0	2.25	As received.
H-145	Some	Yes	Slight	E	Over 12	0	4.50	As received.
Anstac PS	Little or none	Yes	Almost none	E	3	0	1.60	As received.
Merix #79	Some	No	Slight	E	10	0	8.50	As received.
Electrosol	Appreciable amount	No	Noticeable	E	Over 12	0	Note[e]	As received.

[a] E = Excellent.
[b] The test for "Number of rubbings" is conducted by first destaticizing the test molding according to directions of the supplier. A ½-min. dry rubbing of light pressure and reciprocating motion is then administered on the plastic's treated surface with a clean facial tissue. The molding is allowed to stand for 1 to 2 min. at standard laboratory temperature and humidity and is then tested for static charge. The number of rubbings (each with a clean tissue) that a treated molding can withstand before an appreciable charge appears is thus determined.
[c] The washing test is conducted in the same manner as the rubbing test except that the facial tissues are wet with water.
[d] Glim is a household detergent; its chemical equivalent is Antarox A-480.
[e] Two solutions required, available for approximately $8.00 and $12.00 per gallon if applicator is properly licensed.

required to be effective, it would likely lower the mechanical properties of the finished polystyrene considerably and would also darken any material into which it was mixed.

Polonium—A relatively small quantity of this powerful material would be required. However, its cost is high, its health hazard is great, and its half-life is only 5 months.

An attempt was made to surface-coat polystyrene moldings with what was considered to be a safe amount of radioactive material. The surface resistivity of polystyrene thus treated was well over 10^{14} ohms. Since the surface resistivity must be below this figure for the satisfactory discharge of static electricity, this was considered adequate proof of the fact that radioactive surface treatment of molding is at the present time an unsatisfactory answer.

It seems entirely probable that polystyrene could be destaticized by the incorporation of radioactive elements. Such incorporation might well be feasible for highly specialized industrial or military use if highly trained and adequately protected personnel could be employed. However, because of the serious health hazard to molders as well as users, and because of the nearly prohibitive cost for polystyrene thus treated, it appears obvious that this is not a practical solution to the problem of destaticizing polystyrene for widespread commercial use at the present time.

X-rays—Exposure of polystyrene to X-ray radiation appeared to be effective for very limited periods of time. Several wall tile were exposed to 100,000-v. X-ray treatment for 1 minute. After an elapse of 1 hr. these tile were dusted, but during the storage period whatever beneficial effects were imparted at first were lost. The tile thus treated showed typical mixed dust patterns over their entire surface.

Some interesting work along this line was reported several years ago by T. F. Farmer in "Nature." He determined the surface resistivity of polystyrene to be 3×10^{21} ohms. After exposure to 4000 roentgens the surface resistivity dropped to 3×10^{12} ohms, but it began to climb again when aged in air. After 4 hr. it had risen to 10^{14} ohms and after 16 hr. it was up to 10^{15} ohms. It appears from this work that X-ray treatment is a temporary answer, effective at first but very short lived.

Ultra-violet—Exposure of molded polystyrene to ultra-violet light of germicidal wave length (2537 angstroms) resulted in effective destaticization only after surface discoloration and degradation had taken place. The water-wettable surface of the moldings thus exposed collected no dust. However, when the treated surfaces were wiped or washed sufficiently to remove this layer of degraded material, dust again collected to an objectionable extent.

Sulfonation—Several tile were sulfonated by treatment with 50% fuming and 50% concentrated sulfuric acid. The results were almost identical to those described above under ultra-violet light, except that in this case the change which took place on the surface was invisible. The water-wettable sulfonated surfaces were removed rather easily by washing, and after such treatment the dust collecting tendencies returned to normal.

Destaticized Molds and Granules—It was suggested at one time that periodic application of a good destaticizer to the surface of a mold might result in effectively destaticized moldings. Work done in the laboratory with one of the better

(*Continued on p. 169*)

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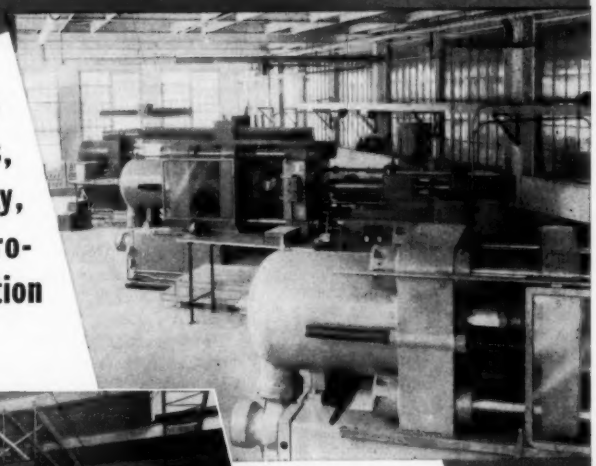

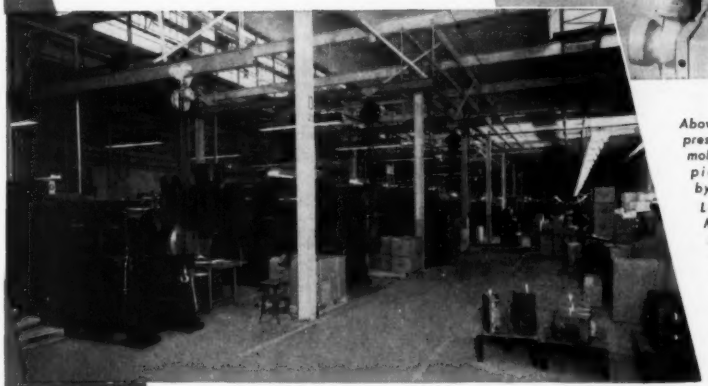

Above: Three large presses capable of molding the largest pieces required by manufacturers.

Left: Section of Molding Room showing 12 ounce, 28 ounce, and 32 ounce machines.

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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

THE ROAD AHEAD. Modern Packaging *24*, 71-9, 173, 175 (Jan. 1951). The economic outlook for 1951 for materials used in packaging is discussed. The materials considered include paper and paperboard, cellophane, metals, wood, rubber, adhesives, inks, waxes, plastics, and glass.

NEW TECHNIQUE OF CARVING. Plastics (London) *16*, 8-9 (Jan. 1951). A new technique, developed by a British artist, for carving on sheet acrylic plastic is described.

PLASTICS GOODS AND FANCY ARTICLES TRADE. Brit. Plastics *23*, 202-3 (Dec. 1950). Census data for the plastics industry in Great Britain for 1948 are reported.

DIELECTRIC RESEARCH. A. E. Javitz. Electrical Manuf. *47*, 101-6, 208-22 (Feb. 1951). The papers presented at the 19th Annual Meeting of the Conference on Electrical Insulation are reviewed and analyzed. Greater emphasis on practical interpretation of developments, high temperature materials, and actual need for fungus protection were leading topics.

Materials

NITRATION OF POLYSTYRENE. H. Zenftman. J. Chem. Soc. *1950*, 982-6. Polystyrene is nitrated by concentrations of nitric acid and mixtures of nitric and sulfuric acids capable of dissolving it. The product contains from 1 to 2 nitro groups per styrene unit, depending on the concentration of the nitric acid, the temperature, and the time. The molecular weight of the polystyrene has no effect. The first substitution is in the para position in the ring, the second randomly along the chain or in the ortho position. Some degradation occurs. Nitration increases the solubility in organic liquids.

EXAMINATION OF COMPOSITIONS PREPARED FROM POLYVINYL CHLORIDE AND RELATED POLYMERS. J. Haslem and G. Newlands. J. Soc. Chem. Ind. (London) *69*, 103-6 (1950). Polyvinyl chloride plastic composition was dissolved in tetrahydrofuran and centrifuged. The resin was precipitated by adding alcohol, filtered, washed, dried, and analyzed for chloride content. The resin content determined by this method agrees closely with that combined in the original composition. Infra-red absorption spectra of the recovered and original resin are identical.

NUCLEAR-METHYLATED STYRENES AND RELATED COMPOUNDS. I. F. R. Buck, K. F. Coles, G. T. Kennedy, and F. Morton. J. Chem. Soc. *1949*, 2377-83. The properties of several styrene derivatives, their polymerization, and the properties of their polymers are described. The transition temperatures, coefficients of thermal expansion, molecular weights, and absorption spectra are reported. The ultraviolet absorption spectra can be used to detect small amounts of monomer.

RECENT DEVELOPMENTS IN THE FIELD OF PLASTICIZATION. D. Faulkner. Brit. Plastics *23*, 183-9 (Dec. 1950). Recent developments in the thermodynamic theories of polymer-plasticizer interaction, evaluation of plasticizers, and new plasticizers are reviewed. 69 references.

Molding and Fabricating

RHEOMETRIC TESTS AND EXTRUSION. S. Eccher. Ind. Eng. Chem. *43*, 479-87 (Feb. 1951). A cylindrical rheometer of the Couette type, suitable for the experimental determination of the rheological properties of extruded materials, was designed to provide data which could not be obtained with existing plastometers. The purpose of this study was strictly practical, as work was performed in connection with a study of extruders. The results obtained on 25 different materials—natural and synthetic rubbers and compounds of both with various fillers—are reported; measurements fall within shear rate limits from 1 to 100 seconds^{-1}. In this interval the relationship between log D (rate of shear) and log τ (shear stress) is nearly a straight line. It may therefore be analytically interpreted by the power law $D=-(r/c)^n$, where n and c are parameters characteristic of the material. As the power law is known to be of limited validity, attempts were made to ascertain the limits of its application in laminar flow through a cylindrical hole. The results of measurements carried out on a 2-in. extruder employing the same materials as were tested by the rheometer are reported. Measurements of pressure and flow were made using discharge holes of various diameters and operating the screw at various speeds. Reasonable agreement was found between values of flow and pressure determined with an extruder and those calculated from parameters n and c determined with the cylindrical rheometer.

NEW ACRYLIC-TO-RUBBER BONDING TECHNIQUE. Brit. Plastics *23*, 198 (Dec. 1950). A process for bonding of rubber to acrylic plastic sheet is described briefly.

Applications

ADHESION OF RUBBER AND TEXTILES. E. M. Borroff, R. S. Khot, and W. C. Wake. Ind. Eng. Chem. *43*, 439-42 (Feb. 1951). The adhesion of natural and synthetic rubbers to textiles was studied. Improvements of test procedure and the use of improved test procedure to separate mechanical from specific factors in textile adhesion with the ultimate aim of designing textiles to give improved adhesion are described. The most important is the establishing of the role played by the projecting fiber end. This is embedded in the rubber and must either be pulled out or broken off in order to separate the rubber from the textile. The work shows that the strength of the bond formed is a function of the number of fiber ends protruding from the textile and of the number broken off in the rubber. A convenient means of obtaining good adhesion of rubber to fabric is suggested by the work. This involves the construction of the textile with a small percentage of spun staple, the fibers of which have high individual tensile strength. A continuous filament warp and a suitable arrangement of picks of continuous filament and spun staple yarns will give the required adhesion. The use of sateen

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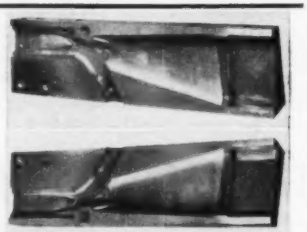

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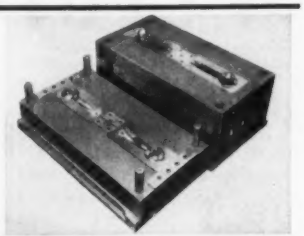

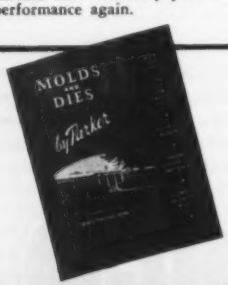

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weaves with spun staple on the weft face, which has also to be proofed, enables fabrics with good adhesion characteristics also to have the sheen characteristics of continuous filament materials.

SYNTHETIC RESIN ADHESIVES FOR METAL BONDING. C. J. Moss. Plastics (London) *16*, (Jan. 1951). The properties of satisfactory adhesives for bonding metals are outlined. The preparation of bonds with a phenolic and an epoxy resinous adhesive is described. Properties of the bonds and applications of these adhesives are discussed.

Coatings

OIL-SOLUBLE PHENOLIC RESINS. R. N. Shreve and B. Golding. Ind. Eng. Chem. *43*, 134-41 (Jan. 1951). Of the many known oil-soluble condensation products of phenols and formaldehyde, the parasubstituted phenols, as a class, are most suitable for use in oleoresinous varnishes. The preparation of the resins most likely to be used commercially and their influence on the physical and chemical properties of varnishes made therefrom were investigated. Properties such as oil solubility, oil reactivity, color stability, drying rate, and resistance to moisture and alkali are listed tabularly for comparison. 84 references.

COATINGS. T. G. Rochow and R. W. Stafford. Analytical Chem. *23*, 212-16 (Feb. 1951). Developments in the methods of chemical analysis of protective coatings during the last two years are reviewed. 164 references.

UREA RESIN FINISHES FOR WOOD SURFACES. Brit. Plastics *23*, 176-7 (Dec. 1950). Urea plastics are used to impart abrasion-resistant, fire-resistant, and more durable finishes to wood surfaces used in table tops, counter tops, and interior finishes of ships and buses.

Properties

CRACKING OF STRESSED POLYETHYLENE. J. B. DeCoste, F. S. Malm, and V. T. Wallder. Ind. Eng. Chem. *43*, 117-21 (Jan. 1951). In a number of applications for polyethylene, particularly cable sheaths and cosmetic containers, it was found that under certain conditions failure of the polyethylene results in a cracking of the plastic. Considerable information is available to show that in an unstressed condition polyethylene is

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FACTORS IN NITROGEN PACKAGING. W. S. Walker. Modern Packaging *24*, 136-140, 192 (Dec. 1950). The packaging of foodstuffs in nitrogen in flexible materials is described. The oxygen permeability of various plastics in film form and of regenerated cellulose and paper are reported.

Testing

ORGANIC - VAPOR TRANSMISSION TEST. T. J. Muldoon, R. S. Couch, and H. M Barnes. Modern Packaging *24*, 123-6 (Jan. 1951). A new method for measuring the rate of transmission of organic vapors through film materials is described.

MEASURING HUMIDITY EQUILIBRIA. A. H. Lamdrock and B. E. Proctor. Modern Packaging *24*, 123-30, 186 (Feb. 1951). A new technique is described for measuring the equilibrium relative humidity of foodstuffs, paper, plastics, and the like.

APPARATUS FOR MEASURING DIELECTRIC STRENGTH AT ELEVATED TEMPERATURES. W. Hand and R. R. Winans. ASTM Bull. No. 171, 63-5 (Jan. 1951). The details of construction of equipment for measuring the dielectric strength of insulating materials at elevated temperatures up to 250° C. are described. The method uses silicone rubber gaskets in contact with the test specimen and pressure to inhibit flashover. Data are presented for plastic laminates for comparison of results obtained by this method with dielectric strength measurements in air and in transformer oil. It was observed that measurements with this device generally lie between measurements in air and in transformer oil.

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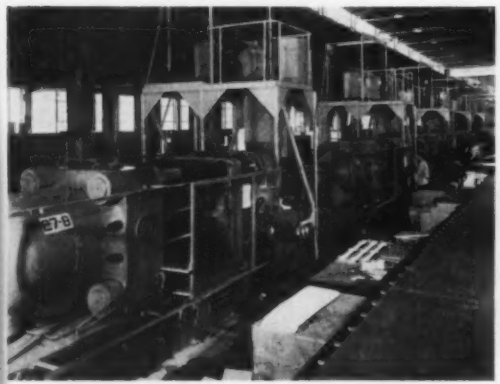

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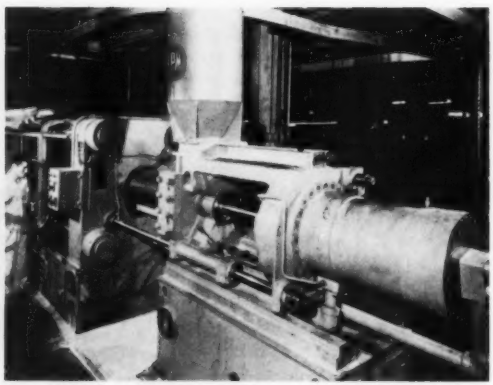

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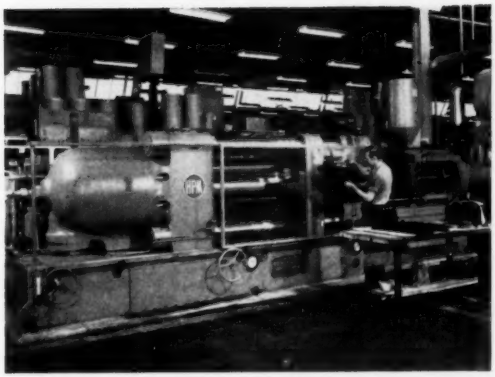
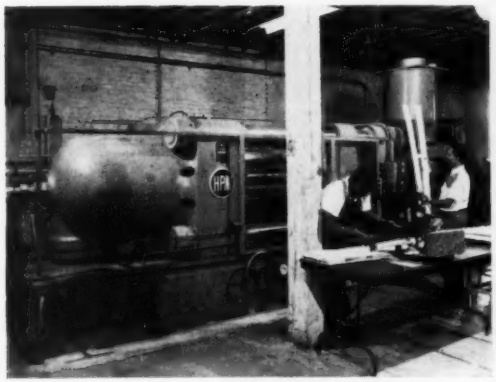
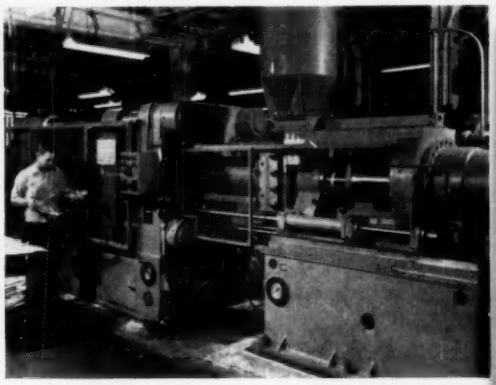


Federal Tool entered the big parts production field with a new H-P-M "60" and a "32" ounce unit.



Victory Mfg. recently expanded their molding facilities when two H-P-M "60s" and two H-P-M "32s" were installed.



Santay, another prominent Chicago custom molder, uses large H-P-Ms including a brand new 60 ounce.

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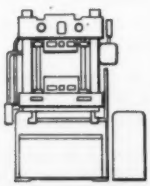
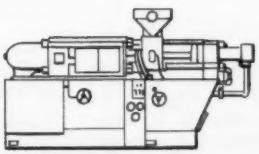
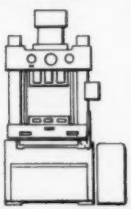


COMPRESSION



INJECTION



TRANSFER

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

STRAIN GAUGE. H. Shoub (to U.S.). U.S. 2,536,101, Jan. 2. Plastic strain gauge.

COATING. N. Sugarman and F. M. Fryman (to Standard Register). U.S. 2,536,107, Jan. 2. A furfural coating activated by acidic vapors.

RESINS. H. E. Weaver and E. G. King (to Armstrong Cork). U.S. 2,536,114, Jan. 2. Heating a vinyl halide resin with alkali, separating, and heating to cure.

SURFACE TREATMENT. A. M. Jamieson (to Carbide and Carbon). U.S. 2,536,183, Jan. 2, Abrading a surface to be bonded while simultaneously applying phenol-aldehyde resin.

HOLLOW ARTICLE. W. Walker and W. H. Moss (to Celanese). U.S. 2,536,243, Jan. 2. Rigid tube of nonorganic fabric provided with a coating consisting of thermoplastic resins.

MOLDS. H. G. Schwarz and E. F. Bures (to Art Electrotype). U.S. 2,536,316, Jan. 2. Electrotype mold prepared by placing the pattern in contact with thermoplastic resin and heating.

PRINT ROLLER. J. Spencer (to Perma-Flex). U.S. 2,536,323, Jan. 2. Polyvinyl chloride printing roller.

PLASTIC COMPOSITION. L. A. Wood, Jr. and E. D. O'Mahony (to R.C.A.). U.S. 2,536,339, Jan. 2. Molded article made of corn protein, pinewood extract, and o-nitrodiphenyl.

GROUTING MATERIAL. G. W. Koehn and A. P. Myers (to Armstrong Cork). U.S. 2,536,375, Jan. 2. Mixture of polyvinyl acetate and anhydrous calcium sulfate suspended in water.

EMULSION. D. Schoenholz and G. O. Morrison. U.S. 2,536,470, Jan. 2. Preparation of freeze-stable polyvinyl acetate emulsions.

POLYVINYL CHLORIDE. G. L. Fraser (to Monsanto). U.S. 2,536,498, Jan. 2. Vinyl chloride resins plasticized with alkyl esters of sulfonyl dipropionic acid.

MOLDING. J. O. Kleber. U.S. 2,536,506, Jan. 2. Plastic mold cycle control apparatus.

DRYING OILS. M. A. Pollack (to E. F. Drew). U.S. 2,536,568, Jan. 2. Allyl esters of fatty acids.

EXPANSION JOINTS. H. C. Miller (to U.S. Rubber). U.S. 2,536,611, Jan. 2. Expansion joints sealed with a composite of coal tar pitch, butadiene-acrylonitrile copolymer, and polymerized vegetable oil.

DRAWING MATERIAL. T. S. Reese (to Di-Noc). U.S. 2,536,657, Jan. 2. Vinyl resin sheet coated with acrylic resin containing abrasive particles used as a drawing material.

PENTAERYTHRITOL ESTERS. A. E. Rheineck (to Hercules Powder). U.S. 2,536,658-9-60-1, Jan. 2. Nitrocellulose compatible pentaerythritol esters.

CONTAINER. W. M. Saidel. U.S. 2,536,773, Jan. 2. Self-sealing container of laminated vinyl plastic sheet material.

PLASTIC. G. J. Van Amerongen (to Rubber-Stitching). U.S. 2,536,789, Jan. 2. Process for preparing chlorinated rubber hydrochloride.

POLYMERIZATION. R. W. Dornte and J. F. McKay, Jr. (to Standard Oil Development). U.S. 2,536,841, Jan. 2. Low-temperature olefin polymerization with sulfur-containing Friedel-Crafts complex catalysts.

COPOLYMERS. A. H. Gleason (to Standard Oil Development). U.S. 2,536,845, Jan. 2. Drying oil-dimer-copolymers.

TUBE FORMING. F. V. Collins (to William F. Stahl). U.S. 2,536,911, Jan. 2. Apparatus for forming tubes from plastic sheet.

POLYVINYL ALCOHOL. G. D. Jones (to General Aniline). U.S. 2,536,980, Jan. 2. Polyvinyl alcohol—1-butene-1,3-dione reaction product and processes for producing same.

POLYMERS. G. R. Barrett (to Monsanto). U. S. 2,537,015-6-7-8-9-20, Jan. 9. Polymerizing a vinyl compound with an unsaturated dicarboxylic acid in the presence of a catalyst and coatings formed therefrom.

POLYMERIZATION. D. W. Chaney (to American Viscose). U. S. 2,537,030-1, Jan. 9. Polymerizing slightly water-soluble monomers in water solution of catalyst.

COPOLYMERS. M. R. Lytton (to American Viscose). U. S. 2,537,146, Jan. 9. Copolymers of acrylonitrile and isobutylene.

MOLDING. J. V. Bertrand (to Hydropress). U. S. 2,537,182, Jan. 9. Injection molding machine.

MOLDING. L. L. Stott (to Polymer Corp.). U. S. 2,537,285, Jan. 9. Equipment for molding elongated shapes.

PLASTIC FORMING. G. A. Lyon. U. S. 2,537,311, Jan. 9. Means for forming plastic material.

POLYMERIZATION. W. L. J. de Nie (to Shell Development). U. S. 2,537,334, Jan. 9. Emulsion polymerization of vinylidene compounds.

POLYESTERS. W. G. Simons and E. H. Daffer, Jr. (to American Cyanamid). U. S. 2,537,375, Jan. 9. Curing polyester resin with 1-hydroxy cyclohexyl hydroperoxide-1 and a metal salt drier.

MIXING DEVICE. F. E. Brown. U. S. 2,537,395, Jan. 9. Machine for mixing plastic material.

WALL TILE. E. Eger (to U. S. Rubber). U. S. 2,537,520, Jan. 9. Wall tile composed of polyester resin—styrene copolymer.

PLASTIC. J. Levy and C. H. Lighthipe (to Nopco Chemical). U. S. 2,537,595, Jan. 9. A blend of vinylidene polymer and mixed phthalate ester plasticizer.

INTERPOLYMERS. K. C. Eberly and R. J. Reid (to Firestone). U. S. 2,537,626, Jan. 9. Interpolymers of isobutene and acrylonitrile.

COATING. E. L. Carr (to Firestone). U. S. 2,537,644, Jan. 9. Polymerizing styrene in emulsion in formamide.

SHEET FORMING. J. S. Gowing (to Dow). U. S. 2,537,666, Jan. 9. Stack-

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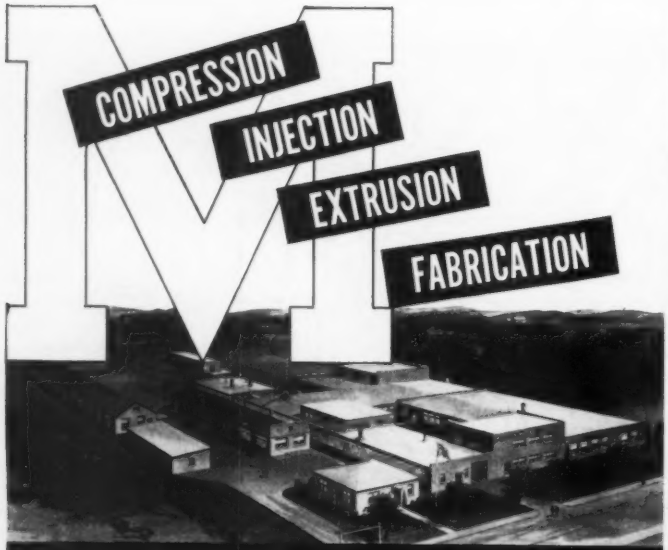

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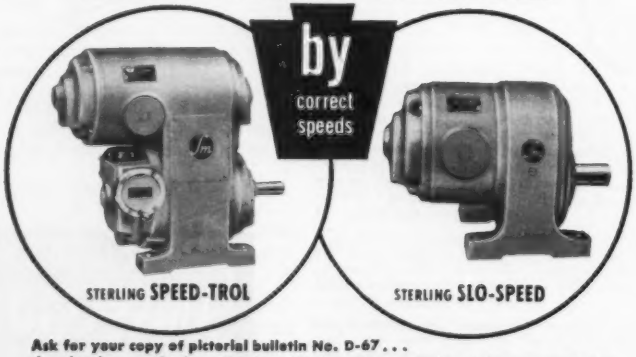

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ing thin films of vinylidene chloride copolymer and then fusing them with pressure.

RESINS. D. T. Mowry and E. L. Ringwald (to Monsanto). U. S. 2,537,689, Jan. 9. Polyamide resins prepared from formaldehyde and a nitrile.

RESINS. H. Rudoff (to Shawinigan). U. S. 2,537,706, Jan. 9. Reacting a polymer of vinyl ester with dimethyl sulfate.

POLYMERS. E. D. Serdynsky, J. S. Gowing, R. M. Wiley, and C. B. Havens (to Dow). U. S. 2,537,712, Jan. 9. Polymeric vinylidene chloride resin having little tendency to acquire an electric charge.

RESIN. A. R. Sexton (to Dow). U. S. 2,537,713, Jan. 9. Thermostable vinylidene chloride resins containing α-methyl benzylbenzoate.

POLYMER. J. B. Dickey (to Eastman). U. S. 2,537,881, Jan. 9. Hydrolyzing a polymer of α-acryloxyacrylonitrile to produce a resinous lactone.

POLYMERS. C. W. Smith (to Shell Development). U. S. 2,537,921, Jan. 9. Polymers of esters of oxygen heterocyclic carbinols.

ALKYD RESINS. H. E. Adams (to Armstrong Cork). U. S. 2,537,949, Jan. 16. Modified alkyd resin coatings.

COPOLYMER. J. L. Amos (to Dow). U. S. 2,537,951, Jan. 16. Composite bodies of popcorn-type monovinyl aromatic polymers.

METHYL METHACRYLATE. J. L. Chynoweth and G. E. Wintermute (to Du Pont). U. S. 2,537,969, Jan. 16. Preparation of polymethyl methacrylate sheet.

ACRYLIC SHEET. R. T. Fields (to Du Pont). U. S. 2,537,970, Jan. 16. Casting acrylate or styrene resin on the surface of a lithium or magnesium chloride.

CELLULAR PRODUCT. F. E. Dulmage (to Dow). U. S. 2,537,977, Jan. 16. Making a shaped thermoplastic cellular body from a mobile gel.

POTTING COMPOUND. P. J. Franklin (to U. S.). U. S. 2,537,983, Jan. 16. Potting composition of ceresin, beeswax, and ethyl cellulose.

CONTAINER. C. R. Irons and G. W. Stouton (to Dow). U. S. 2,538,002, Jan. 16. Copolymer of vinylidene

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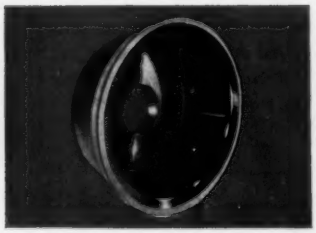

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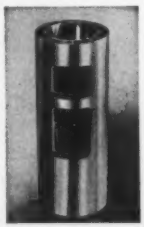

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COPOLYMERS. J. L. Schick (to Dow). U. S. 2,538,049-50, Jan. 16. Method of preparing high vinyl chloride, low vinylidene chloride copolymers.

POLYMERIZATION. J. L. Schick (to Dow). U. S. 2,538,051, Jan. 16. Aqueous suspension polymerization in the presence of methyl hydroxy-propyl cellulose as granulating agent.

EPOXIDES. J. D. Zech (to Devoe and Raynolds). U. S. 2,538,072, Jan. 16. Preparation of polyepoxides by reacting in non-aqueous medium a polychlorohydrin ether of a polyhydric alcohol.

COPOLYMERS. E. P. Ivany and E. F. Landan (to Celanese). U. S. 2,538,100, Jan. 16. Vinyl sulfone copolymers.

PLASTICIZERS. R. J. Lee and R. H. Reiff (to Pan American Refining). U. S. 2,538,254, Jan. 16. Ketone plasticizers used for polyvinyl chloride resins.

LATICES. C. E. Rhines (to U. S. Rubber). U. S. 2,538,273, Jan. 16. Reducing pH, in the presence of alcohols, of a synthetic resin latex to increase particle size.

RESINS. R. N. Evans and A. P. Ingrassia (to Masonite). U. S. 2,538,302, Jan. 16. Lignin-furfuryl alcohol resins formed with acid catalyst, heat, and pressure.

RESIN. E. G. Rochow (to G. E.). U. S. 2,538,657, Jan. 16. Polymeric tetraallyl silane.

LATEX. G. W. Stanton and C. E. Lowry (to Dow). U. S. 2,538,737, Jan. 16. Film-forming latex of unplasticized ternary vinylidene chloride copolymer.

RESINS. R. A. Barkhuff, Jr. and L. M. Debing (to Monsanto). U. S. 2,538,753, Jan. 23. Reacting formaldehyde with thiophene and a phenol.

COPOLYMER. P. G. Carpenter (to Hercules). U. S. 2,538,761, Jan. 23. Copolymers comprised of chloromaleic anhydride and unsaturated hydrocarbons.

COPOLYMERS. A. D. F. Toy (to Victor Chemical). U. S. 2,538,810, Jan. 23. Copolymers of diallyl esters of dicarboxylic acids with di-β-γ-unsaturated alkenyl aryl phosphonates.

COATING. R. A. Barkhuff, Jr. (to

(*Continued on p. 124*)

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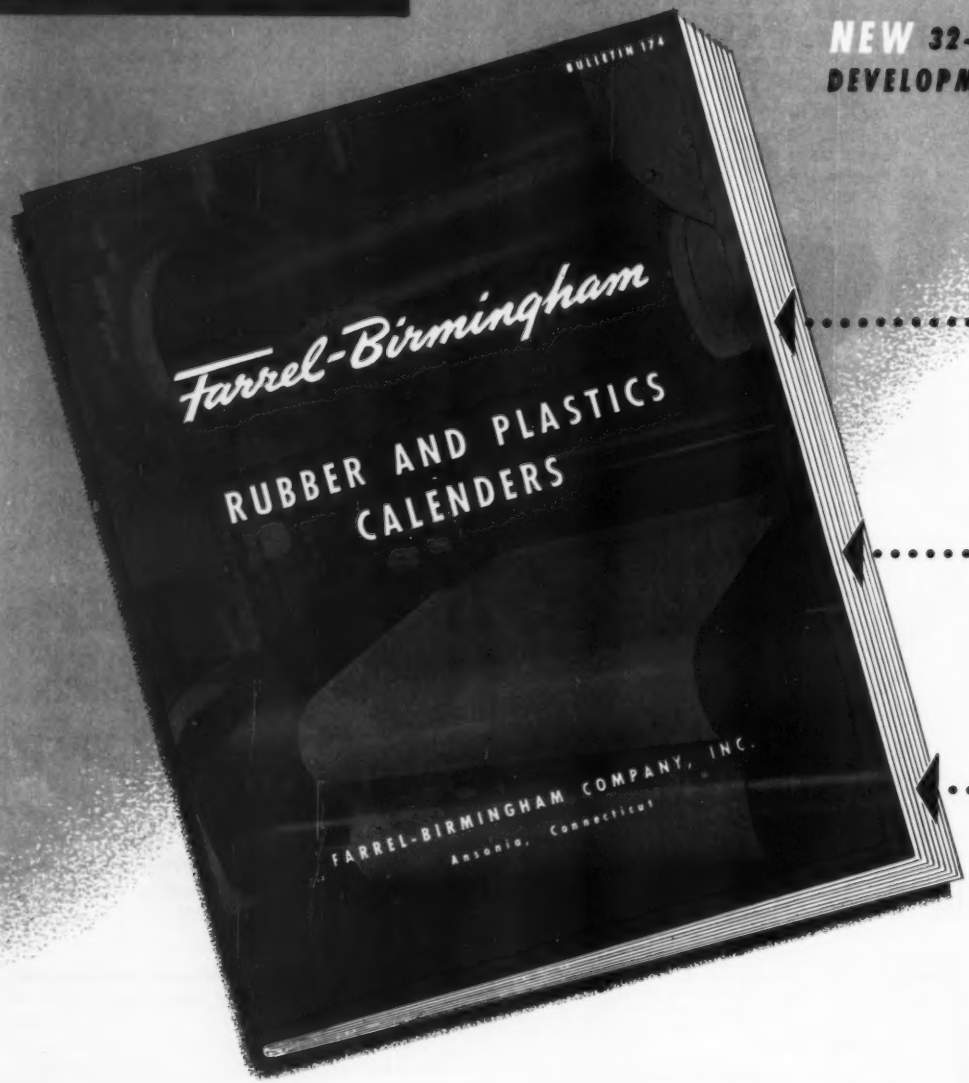

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Monsanto). U. S. 2,538,857, Jan. 23. Coating comprising a thiophene-aldehyde condensate.

RESINS. C. F. Schrimpe (to Carbide). U. S. 2,538,883-4, Jan. 23. Phenol-modified acetone-formaldehyde resins.

RESIN. J. R. Ehrlich. U. S. 2,538,900, Jan. 23. Thermoplastic mixture of acrylic polymer and phenol-modified coumarone-indene resin.

POLYMERS. K. M. Gaver, E. P. Lasure, and L. M. Thomas (to Keever Starch). U. S. 2,538,903, Jan. 23. Substituted 2-carboxylic acid esters of glucopyranose polymers.

STRAINER. A. N. Gray (to Western Electric). U. S. 2,539,128, Jan. 23. Straining device for use with plastic material.

RESINS. M. M. Safford (to G. E.). U. S. 2,539,207, Jan. 23. Vinyl halide resins plasticized with polymerizable polyester resin.

SKI. L. Beerli. U. S. 2,539,224, Jan. 23. Ski having a plastic plate.

GLASS FABRIC. B. H. Foster (to U. S. Rubber). U. S. 2,539,301, Jan. 23. Glass-thermoplastic composite fiber fabrics.

COATING. P. F. Sanders (to Du Pont). U. S. 2,539,329, Jan. 23. Process for coating inorganic fabric with polytetrafluoroethylene.

POLYVINYL CHLORIDE. J. R. Darby (to Monsanto). U. S. 2,539,362, Jan. 23. Polyvinyl chloride resin stabilized with a mixture of a monoalkoxyethyl fumarate.

THERMOSETTING RESINS. J. J. P. Staudinger and H. M. Hutchinson (to Distillers Co., Ltd.). U. S. 2,539,376-7, Jan. 23. Production of cross-linked polymerized acrylic resins or styrene resins.

RECORD. C. L. Parker (to R. C. A.). U. S. 2,539,385, Jan. 30. Sound record from polyvinyl halide, butadiene-acrylonitrile rubber, and Vinsol.

CELLULOSE DERIVATIVE. V. R. Grassie (to Hercules). U. S. 2,539,417, Jan. 30. Reacting cellulose with aqueous alkali metal hydroxide and heating with methyl acrylate.

POLYMER. E. L. Kropa and J. J. Padbury (to American Cyanamid). U. S. 2,539,438, Jan. 30. Polymerized unsaturated tetrafluorosuccinate ester.

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Monsanto). U. S. 2,538,857, Jan. 23. Coating comprising a thiophene-aldehyde condensate.

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Staudinger and H. M. Hutchinson (to Distillers Co., Ltd.). U. S. 2,539,376-7, Jan. 23. Production of cross-linked polymerized acrylic resins or styrene resins.

RECORD. C. L. Parker (to R. C. A.). U. S. 2,539,385, Jan. 30. Sound record from polyvinyl halide, butadiene-acrylonitrile rubber, and Vinsol.

CELLULOSE DERIVATIVE. V. R. Grassie (to Hercules). U. S. 2,539,417, Jan. 30. Reacting cellulose with aqueous alkali metal hydroxide and heating with methyl acrylate.

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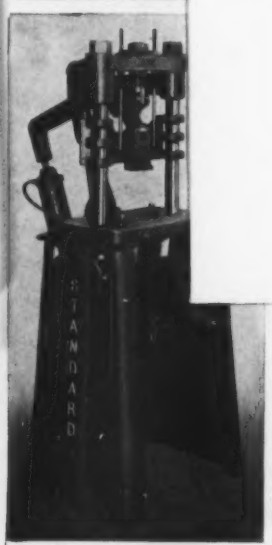

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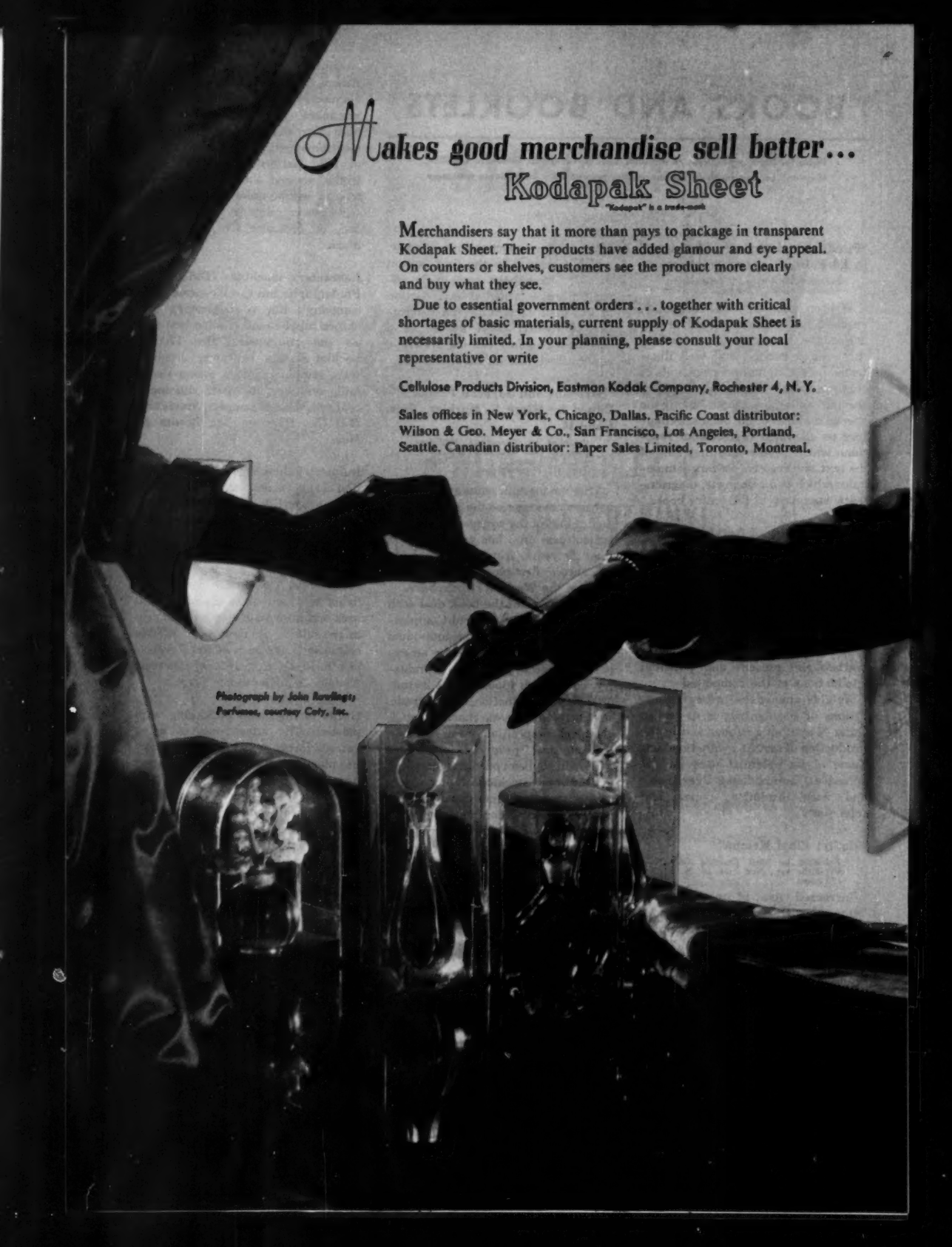

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Fundamental Organic Chemistry" by Ed. F. Degering and collaborators.

Published by University Lithoprinters, Ypsilanti, Mich. 516 pages. Price $4.50

Written especially for beginning students in organic chemistry, chemistry majors, and chemical engineers, this text is concise and well illustrated by equations and graphs; its 24 chapters cover the fundamentals of the field under discussion. Among the special features of the book are chapters on classified replacement reactions which review the first half of the text, and reactive centers of molecules which is a composite, diagrammatic summary of the entire book.

"The Chemistry of Acrylonitrile"

Published by Industrial Chemicals Div., American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y. 96 pages

First major publication on the subject of acrylonitrile and its applications, this compact book discusses the synthesis and physical and chemical properties of the material and summarizes the present and potential applications of the compound.

Notable among the present applications of acrylonitrile is its use in Buna-N synthetic rubber and in the production of certain synthetic fibers. Some of its potential uses include adhesives, antioxidants, dyes, cable and wire insulation, paper, and solvents.

"Methyl Ethyl Ketone"

Published by Shell Chemical Corp., 500 Fifth Ave., New York 18, N. Y. 130 pages

Increased use of methyl ethyl ketone by a variety of industries during the past decade has prompted the preparation of the second edition of this book, which is designed to assist prospective users in determining the suitability of this product for their manufacturing requirements. The latest technical information on applications and chemical and physical properties are given. Since methyl ethyl ketone is of particular interest to the surface coatings industry, the sections devoted to its properties in this usage, which appeared in the first edition in 1938, have been completely rewritten and enlarged. A large portion of the data concerning the properties of methyl ethyl ketone as a solvent for surface coating materials is published here for the first time.

"Soybeans and Soybean Products" Edited by Klare S. Markley. Vols. I and II.

Published by Interscience Publishers, Inc., 250 Fifth Ave., New York, N. Y. Vol. I, 558 pages; Vol. II, 621 pages. Price $11.00 per volume

This monograph contains comprehensive coverage of the soybean industry and of the soybean itself. This agricultural crop has grown, in less than 25 years, from relative insignificance to first place among oilseed crops of the Western Hemisphere.

The sections of the book deal with Production, Structure and Composition, and Processing. The individual chapters, each contributed by an expert in different phases of the industry, cover such topics as the history of soybean production, world trade, structure and genetic characteristics, chemical composition of the seed and oil, physical properties, nutritive factors in soybean products, handling and storage, mechanical processing.

The second volume concludes the processing discussion and covers the utilization of soybean products. Chapters deal with processing edible oil, its nutritional value, oil meal for livestock and poultry, protein food products, and so on.

Electromagnet—A new research tool, claimed to be the most powerful and versatile electromagnet commercially available, is described in this four-page folder. The ADL Electromagnet is a unit for producing high flux density magnetic fields, and incorporates many of the best features of the company's previous designs. For example, the unit, which weighs two tons, produces the same magnetic fields as other electromagnets weighing 15 to 50 times as much. Among the outstanding features claimed for the unit are compactness, minimum operational supervision, high flux density, minimum stray electromagnetic interference, variety of field patterns, accurately controlled air gap, simplicity of experimental setup, quiet operation, and wide power range. *Arthur D. Little, Inc., 30 Memorial Dr., Cambridge, Mass.*

Laboratory machines (Bull. 067)—Photographs and specifications of the company's line of laboratory machines supplement detailed text data on the equipment. The 12-page booklet covers crushers, crushing rolls, sample grinders, swing-sledge mill, and an improved automatic coal crusher and sampler. *Sturtevant Mill Co., Harrison Sq., Boston 22, Mass.*

Industrial chemicals—The 1951 edition of this catalog includes specifications, properties, and typical uses of all of the industrial chemicals manufactured by the company. Of particular interest is the inclusion of solubility data covering aromatic compounds. A two-page chart listing fields in which these chemicals find uses and information on sodium cellulose sulfate, the new water soluble cellulosic, have been added. *Tennessee Eastman Co., Div. of Eastman Kodak Co., Kingsport, Tenn.*

Guide to improved packaging with plastics—The advantages of using various forms of Bakelite and Vinylite plastics in 21 different packaging uses and displays are cited in this eight-page booklet. Properties of the specific plastic or resin employed are listed with each application, and a photographic illustration shows at least one typical example. Packaging applications are classified under the general headings of Coatings, Film and Sheeting, Molded and Blown Plastics, Sheet Materials, Foil Laminations, and Adhesives. Subheadings give specific uses. *Bakelite Co., Div. Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y.*

Decorating styrene—Decorative treatments for Lustrex styrene plastic are described in this 28-page illustrated booklet. Post-molding processes discussed include metaliz-

(*Continued on p. 130*)

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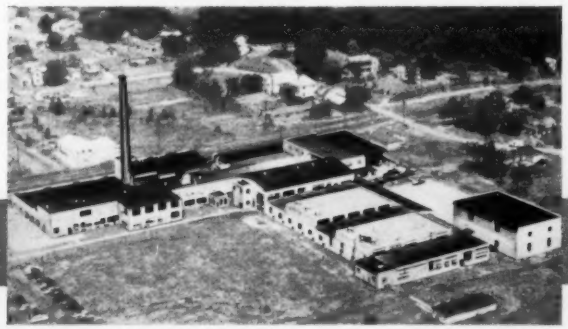

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Reinforced low pressure moldings for chemical containers, tote boxes, shipping pallets and housings for electrical and mechanical equipment.

Acrylic sheet forming for aircraft enclosures, gun turrets, blisters, windows and canopies.

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Bailey Mixers are designed for rapid, extremely thorough, intimate mixing. Rounded corners facilitate cleaning, and water or steam jacketing is available.

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ing, lacquering, all types of stamping and printing, and destaticizing. Operating methods and processes are illustrated by charts and photographs, and metalizing methods include electroplating, spraying, vacuum metalizing, and cathode sputtering. Lists of materials and suppliers are contained in each section. *Plastics Div., Monsanto Chemical Co., Springfield, Mass.*

Processing equipment (CEC-50)—The wide range of processing equipment and machinery designed and built by this firm is described and illustrated in this 36-page condensed catalog. Agitating and mixing equipment, kneading and blending units, grinding and classifying equipment, synthesizing and processing systems are featured. *The Patterson Foundry & Machine Co., East Liverpool, Ohio.*

Testing instruments for the paint and other industries—Descriptions of the 75 items made or sold by this laboratory are presented in condensed form in this 32-page catalog. Instruments are classified under the following headings: viscosity, constant temperature baths, film thickness—film applicators, drying time, abrasion, hardness and adhesion, portable gloss and reflection meters, appearance and color, and miscellaneous testing devices. *Gardner Laboratory, Inc., 4723 Elm St., Bethesda, Md.*

Buffing and polishing compositions—Plating and finishing shop men will be interested in this 20-page catalog which contains information on the buffing and polishing of plastics and metals. Charts show compositions to use on all types of materials from aluminum to zinc. Composition tests, characteristics of various kinds and grades of compositions, and other useful data are presented. *Lasalco, Inc., 2840 LaSalle St., St. Louis 4, Mo.*

Rubber and plastics calenders, Bull. 174—The company's complete line of calenders for processing rubber and plastics is described in this 32-page booklet. Included are general specifications, recent design improvements, parts lists and drawings, a diagram of roll arrangements used in various kinds of production, and illustrations of over 30 calendering

(*Continued on p. 133*)

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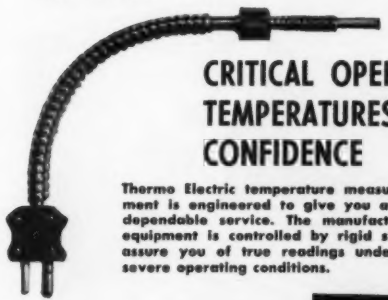

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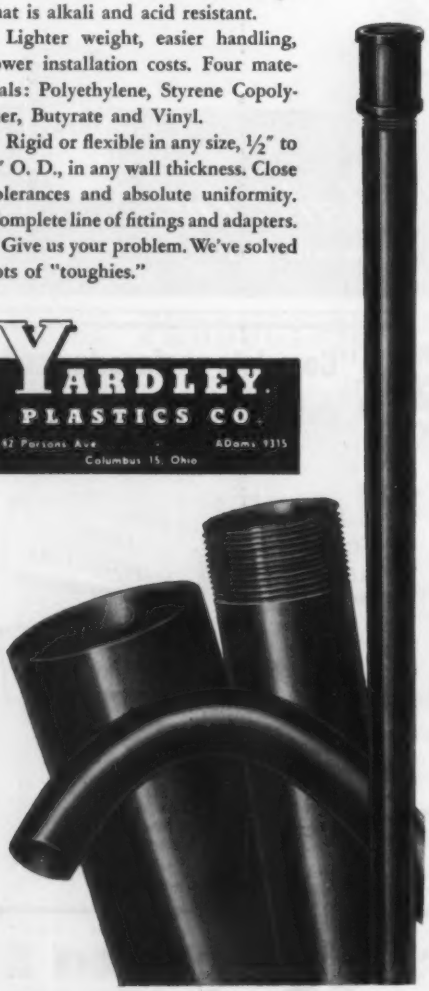

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machines of different types and sizes. Brief descriptions of allied equipment and examples of specially engineered plant layouts are also given, along with illustrations of the company's process-testing laboratory where equipment is installed and maintained for the use of manufacturers for carrying on experimental work. *Farrel-Birmingham Co., Inc., Ansonia, Conn.*

Here's Rogers and its Fiberloy— Duplication of production runs on experimental equipment, labor relations, and product development are among the wide variety of topics lightly but deftly dealt with in this 36-page booklet. Other modern industrial problems are considered under such titles as, "A Purchasing Agent's lot is not a happy one", "The dear, dead business of accounting," and "Henry Ford looks at plastics." *Rogers Corp., Manchester, Conn.*

Plastic processing machinery (Catalog No. 125)—Fully illustrated, this 18-page catalog contains information on machinery for processing and handling continuous webs of plastic material—manufacture of plastic films (supported and unsupported), solution coating, dispersion coating, hot melt coating, calendering, extruding, casting, embossing, polishing, printing, lamination, and so forth. *John Waldron Corp., P. O. Box 791, New Brunswick, N. J.*

Prepackaging food with Lumarith— Illustrated in both full color and black and white, this brochure gives the outstanding characteristics of this acetate film that permits fresh vegetables and fruits to "breathe" without the need of holes, vents, or perforations. Specific qualities for certain products are also listed. *Transparent Films Dept., Celanese Corp. of America, 180 Madison Ave., New York 16, N. Y.*

Carbide tools (Cat. No. GT-250)— All data carried in former tool catalogs and supplements issued by the company, as well as new items added to stock, are combined in this 60-page manual. The catalog not only lists tools, but tells how to select and apply them. Differences and limitations in the various grades of carbide are clarified. *Carboloy Co., Inc., Box 237, Roosevelt Park Annex, Detroit, Mich.*

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1. Heavy Duty Engravograph (illustrated) Catalog H 20
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ELECTRIC OVEN—The shape of the remodeled Straddle-Type Infra-Red electric oven—manufactured by Wil-Son Mfg. Corp., Cloverport, Ky.—can be adjusted to fit the job being done, regardless of size or shape, thus permitting accurate and even heating. Ovens are supplied in long standard sections of 23, 32, and 48 in., which can be joined tightly end to end to make any length of oven. Each row is 8 in. wide, and rows can be added to increase the oven width. Every lamp row has a positive lock hinge attachment so that, for example, a six-row oven can be adjusted from a flat bank to a closed circle.

Wil-Son ovens are adaptable to heating, preheating, drying, and finishing applications in plastics operations. Asbestos insulation panels are provided to prevent heat loss around the lamps. Side panels and an adjustable table assembly are supplied.

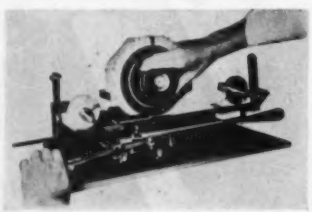
MOLD POLISHING—Effective and economical polishing of molds for producing quality plastics products are features claimed for the diamond compound, abrasive stones, and polishing accessories manufactured by Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, Mich. The compound, packed in either 5- or 18-g. cartridges, is produced in a variety of colors, grades, and size ranges to meet specific finishing requirements. It can be applied by a special gun made for each of the two cartridge sizes and equipped with micrometer plunger feed.

D-M-E silicon-carbide, vitrified-bonded abrasive stones come in flat, square, round, and triangular shapes in a wide range of widths, lengths, thicknesses, and grits. Also available are flat, round, or square polishing sticks, supplied in 6-in. lengths, and a thinner lubricator.

FLOW-REGULATING VALVE—Development of a new valve for jet and spray pumps, for use as a by-pass, or wherever an exact setting of regulated flow is required has been announced by Reynolds-Shaffer Co., Dept. F-51, 12100 Cloverdale Ave., Detroit 4, Mich. "O-Ring" packing is provided to prevent external leaking; close fitting permits only the slightest internal weeping, yet the plug can be turned easily for manual adjustment.

The new valve—of ¾-in. pipe size and 2½ in. long—comes with two plug types: R-V #1 is full ported with area of 1 in. pipe in port; R-V #2 has a ¼-in. port for fine adjustments, and can be used in place of needle valves.

HOT STAMPING EMBOSSER—Numbers or letters can be embossed in color on a wide variety of materials by the roll leaf transfer tape of a new hot stamping machine produced by The Acromark Co., 310 Morrell St., Elizabeth 4, N. J. The Acromarker Model 1H, as it is designated, has 40 individual interchangeable and replaceable characters in its die wheel. Characters are selected by rotating this wheel by means of a hand knob; an easily read index with indicator shows the selection made.



A frame extends right and left to carry the transfer tape feed roll and rewind roll for the color tape. Guides carry color tape directly under the dies. In operation, the stamping head revolves in one position, but the double slide table to which work is clamped moves left or right and in or out so that material to be stamped is brought into position, then lifted against the die. An automatic advance slides the feed table forward at each swing of the screw pressure lever, thus providing automatic spacing of letters. Die sizes in this model range from 1/16- to 3/16-in. characters, but a larger model, No. 7H, provides sizes up to ⅜ inch.

MOLD TEMPERATURE CONTROL—Automatic control of temperatures in molds, platens, and other plastic production equipment is the objective of the Model #3 Impco Temperature Controller introduced by Improved Paper Machinery Corp., Nashua, N. H. Model #3 has a tank capacity of 15 gal. with a centrifugal circulating pump of from 5 to 35 gal./min. at 52- to 26-ft. head. Working temperature ranges from 70 to 250° F.; temperature can be held to within 2° F. A major temperature regulation feature of the equipment—which is 35 in. high, 18 in. wide, and 30 in. long—is an indicating thermostat with adjustable maximum-minimum settings for controlling two 3000-watt, corrosion-resistant sheath heating elements, and a water-cooled, multipass heat exchanger.

HIGH PRESSURE VALVES—A series of high pressure hydraulic check valves has been developed by Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N.Y., to meet operational requirements peculiar to high pressure, high flow circuits. The principal feature of the Greer Check Valve is that the action is dampened both in the opening and closing of the valve by guiding a poppet on a hollow shaft which contains a dashpot chamber. The action of the poppet—designed to prevent shock and hammer—has been found especially valuable in circuits where accumulators are used and where extremely high flow conditions develop. The valve is rated satisfactory for systems operating up to 5000 p.s.i. Sizes for ½ to 2-in. pipe are available.

HOPPER-DRYER—Greater production, lower costs, and higher quality are merits claimed for the D & W Hopper-Dryer designed for use with plastics injection and extrusion molding machines and produced by Thoreson-McCosh, Inc., 18229 W. McNichols Rd., Detroit 19, Mich. Use of the equipment makes possible continuous drying and preheating of plastics material after it is put into the hopper; thus material moves from the receiving department to the molding machine with a minimum

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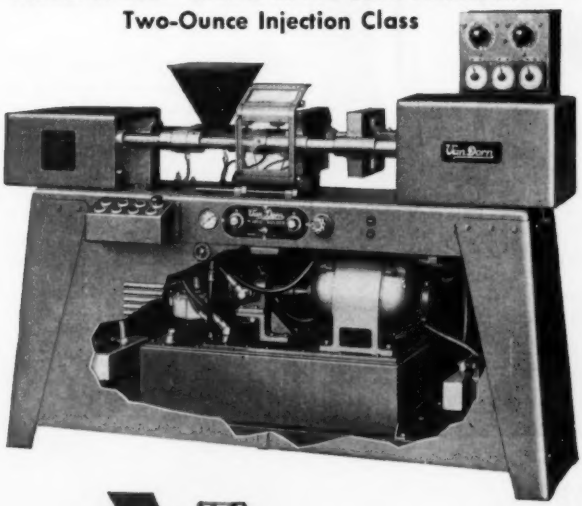
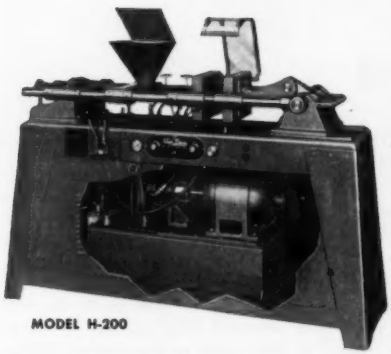
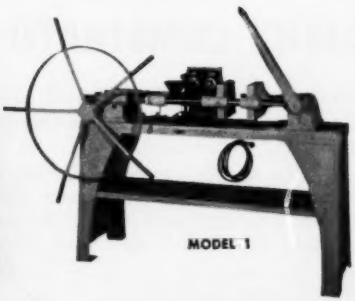
Model H-200—Leader in the Semi-Automatic Two-Ounce Injection Class



This ultra-modern press molds practically all thermoplastics including nylon. It completes up to 6 operating cycles per minute. Push button controls are safe, simple and convenient. Compact and rugged, the unit is quiet and economical in operation. Sliding gate with interlocking safety devices starts the cycle. Solenoid valves close the molds. Injection and dwell are controlled by first of three timers on the rear panel. Center timer regulates recharging of heater. The third timer controls the length of the mold close cycle; when time runs out, molds automatically open and parts are ejected. Operator opens safety gate, removes product and then closes gate to begin the next cycle . . . Variable voltage transformers in conjunction with thermostatic units control the temperatures on the two heating zones accurately.



MODEL H-200



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Power Operated, Lever Controlled Presses

2-oz. or 1-oz. capacity. These low-cost units operate 8 hours for under a dollar and use inexpensive molds. Can easily be set up in twenty minutes by one man.

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1-oz. capacity. This press is ideal for smaller jobs, experimental work and technical training.

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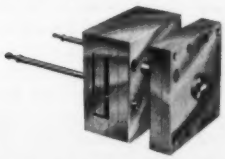
Grinds up rejects, waste, etc., for re-use. Ruggedly made, designed for easy cleaning.



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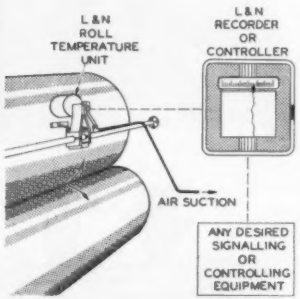
of handling. Moreover, thorough conditioning and preheating of material by controlled heat is said to increase production by reducing rejects caused by insufficient drying.

Other features claimed for the equipment include: economy of floor space, since the hopper-dryer can be installed on top of the molding machine or in out-of-the-way off-the-floor locations; better quality output as the result of thermostatically controlled temperature and dehumidification of material; and minimum maintenance costs.

ROLL TEMPERATURE MEASUREMENT—The temperature of a moving roll surface can be measured by a new device which does not touch the roll, and thus cannot scratch, score, or in any way damage delicate surface films. A product of Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., the new instrument is applicable to roll diameters



down to 9 in. and to flat surfaces. It operates independently of surface speed, emission characteristics, and finish, and can be mounted at any point on the roll where temperature measurement is desired.

Temperature detected by the unit is recorded automatically by either a Micromax or Speedomax accessory supplied as an integral part of the complete equipment. The detecting element of the instrument is a measuring head, contoured to fit the roll and mounted $\frac{1}{32}$ in. from the surface. A continuous stream of air is sucked past the measuring element, and thus heats it to practically the same temperature as the roll surface. A compound joint with spacing slide makes it easy to position the measuring head concentric with the roll and at the proper spac-

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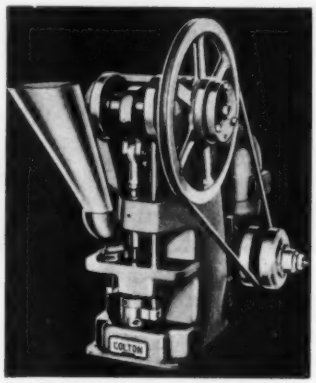
ing distance. Should material adhere to the roll surface, a safety bumper retracts the measuring head.

TIME DELAY CONTROL SWITCH—Time dwell of from ¼ to 10 sec. is permitted by a new positive time delay control switch designed by Pneu-Trol Devices, Inc., 1436 N. Keating, Chicago, Ill. The switch is adaptable to electric solenoid valve controls used with air or hydraulic cylinders. An important advantage claimed for the compact unit is that its small size permits it to be mounted near the mechanical stop without interfering with the machine movement. The switch automatically resets itself after each actuation. Time delay adjustments are easily made by turning a knurled adjustment screw.

TABLET PRESS—Many applications to which a standard, volume-production tablet press is not economically adapted may be handled successfully on a new bench-type tablet press developed by Arthur Colton Co., Div. Snyder Tool & Engineering Co., 3400



E. Lafayette Ave., Detroit 7, Mich. Designated Colton No. 301, the new machine is available in two models, one for manual and one for motor operation. It is designed for laboratory experimental and research work and for limited production.

Tablets produced on this unit are comparable to those made on larger presses. Maximum specifications include: depth of fill, 7/16 in.; diameter of piece, ½ in.; pressure from above, 1½ tons; production per minute, 87, with a minimum output per minute of 32.

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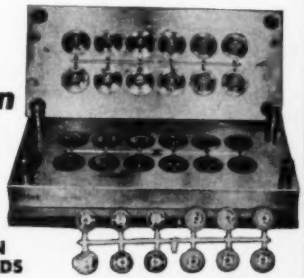

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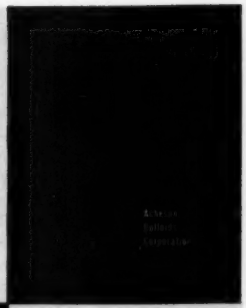

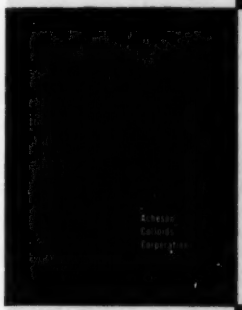

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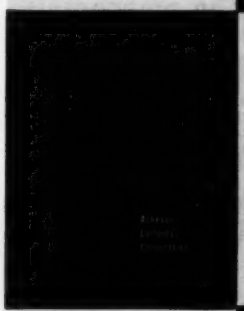

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9th Annual Canadian S.P.I. Conference

A RECORD attendance of 175 executives of the Plastics Industry from both Canada and the United States was registered at the 9th Annual Conference of the Society of the Plastics Industries (Canada) Inc., held at The Mount Royal Hotel, Montreal on March 5th and 6th.

The conference was broken into four main sections: procurement, economic influences, technology, and the Society reports.

The morning session of March 5th featured a welcome from L. C. McLeod, outgoing president of S.P.I. (Canada) and sales manager, Plastics Div., Monsanto (Canada) Ltd. A. E. Byrne, head of the Chemical Div., Canadian General Electric Limited, Toronto, and program chairman, outlined the program.

First speaker was Hiram McCann, editor of MODERN PLASTICS and "Modern Plastics Encyclopedia," whose subject was "Mobilization's Challenge to Plastics." Working from charts, Mr. McCann outlined the foreseeable balance in the United States between volume of several main materials for military application during the present year and the volume of those same materials that will be available for civilian consumption, relating both to materials production as of October, 1950, and to the apparent civilian demand for such materials. The speaker stressed the importance of every molder, laminator, fabricator, and processor balancing his civilian business with defense orders.

Second speaker was Arnold Smith, president, Monsanto (Canada) Ltd. His topic was "Shortages and the Plastics Industry." He showed that, in general, the plastics supply picture in Canada is similar and proportionate to that in the United States, with certain small advantages in specific resins in each country.

Glen Gay, member of the Defense Research Board, Dept. of National Defense, spoke on "Service Requirements for Plastics." He outlined the technologists' approach to plastics for military use and presented several groups of unclassified military applications in which plastics are now playing or can play in the future an important part.

The convention luncheon on March 5th was addressed by Ralph Maybank, parliamentary assistant to the Minister, Resources and Development Dept., speaking on "Canada's Resources for an Expanding Plastics Industry."

Dr. Herbert Moore, president, Psychological Service Centre, addressed the second session on "Development of Manpower."

"Management Faces Production Problems" was the subject of an address by S. B. Riazanoff, production manager, Canadian Buttons Ltd. Stating that cost concept in the Plastics Industry changes from company to company and from product to product, Mr. Riazanoff showed that it is still easier to measure costs in any industry than many other elusive factors. Any molder has to know his costs before he can control those costs, either to improve products at the same cost or to lower costs for the same product.

(*Continued on p. 143*)

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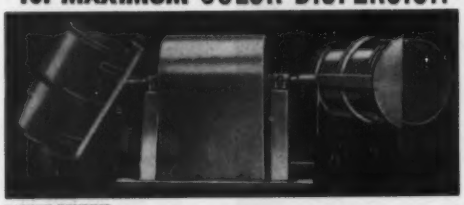

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PLASTIC PAINT. Technical data sheet containing information on the composition and uses of an acid- and alkali-resistant protective paint based on a resin polymer. American Resinous Chemicals Corp. **(5-801)**

EXTRUSION MACHINE. Specification sheet containing details concerning the T.M.A. 3½-in. single-screw plastic extrusion machine manufactured by R. H. Windsor Ltd. **(5-802)**

INDUSTRIAL GLOVES. Folder covering the advantages of Jomac heat-resistant, flame-resistant gloves. Several popular styles are illustrated. C. Walker Jones Co. **(5-803)**

EXTRUDING NYLON. Technical service bulletin containing details on the process of extruding nylon, including design of extruder components, molding powder types, methods of extrusion, and trouble shooting. Eight pages. E. I. du Pont de Nemours & Co., Inc. **(5-804)**

LATEX FOR PAPER COATINGS. Technical data on properties and formulations of Pliolite Latex 170 for coating paper to give it water-vapor transmission resistance, chemical resistance, grease and oil resistance, and heat sealing properties. The Goodyear Tire & Rubber Co., Inc. **(5-805)**

DECAL NAME PLATES. Discussion of various transferable color films which can be applied to molded or flexible plastic items for purposes of brand identification, instructions, etc. Contains design and use suggestions. The Meyercord Co. **(5-806)**

MOLD TEMPERATURE CONTROL. Folder describing a self-contained unit that preheats molds and maintains constant mold temperatures by regulating the temperature of water circulating through the mold. Sterling, Inc. **(5-807)**

HEATING PLATENS. Leaflet containing illustrations of the operations involved in manufacturing precision steam and electric heating platens for use in the plastics industry. T. H. & J. Daniels Ltd. **(5-808)**

HEATING UNITS. Various band, coil, and other shape heating elements and heating platens for extrusion, injection, and compression molding are covered in this six-page bulletin. Thermel Inc. **(5-809)**

MOLD PLATING. Folder giving a list of advantages to be gained by chrome plating plastic molds. Nutmeg Chrome Corp. **(5-810)**

STYRENE. Group of three bulletins covering the technique of annealing styrene, moldability of various grades of Koppers styrene, and a chart listing the general properties of different styrene formulations. Koppers Co., Inc. **(5-811)**

WIPE-IN KOLORS. Description of a coloring medium for use in filling recessed areas on plastic items to give contrast to lettering, etc. Includes instructions and color chart. Keeler & Long, Inc. **(5-812)**

WELDING SPEED STEELS. Bulletin describing the techniques for welding speed steels of a type used for molds and dies. Gives complete recommendations on electrodes, rod size, etc., W. J. Holliday & Co. Inc. **(5-813)**

HIGH VACUUM METALLIZING. Magazine reprint covering the technique of providing plastic products with metal coatings by the high vacuum process. Distillation Products Industries, Div. of Eastman Kodak Co. **(5-814)**

DRY COLORING POLYESTER RESINS. Pocket size folder covering the technique of dry coloring polyester resins. Includes specific recommendations on batching. Ferro Enamel Corp. **(5-815)**

PLASTIC MILLS. Catalog containing illustrations, features, and descriptions of the line of rubber and plastic mills manufactured by Erie Engine & Mfg. Co. **(5-816)**

MOLD TEMPERATURE CONTROL. Description of the features of a unit for maintaining constant mold temperature automatically by circulating heated fluid through the mold. Improved Paper Machinery Corp. **(5-817)**

LAMINATED INSUROK. Catalog insert describing the properties, physical characteristics, and features of a cotton fiber mat base phenolic laminate for mechanical applications needing uniform strength in all directions. The Richardson Co. **(5-818)**

PLASKON ALKYD. Summary of the advantages to be obtained by using Plaskon alkyd thermoset plastic for certain electrical applications. Plaskon Div., Libbey-Owens-Ford Glass Co. **(5-819)**

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UTILITY ENGRAVER. Booklet on the Panto heavy-duty bench-type engraver for engraving plastics, metals, etc. Contains type samples and illustrations of supplementary equipment. H. P. Preis Engraving Machine Co. **(5-823)**

AUTOMATIC MOLDING PRESS. Description and specifications of Stokes No. 235-A completely automatic plastic molding press. F. J. Stokes Machine Co. **(5-824)**

COMPRESSION TEST MACHINE. Features of two machines for compression testing containers of different types. Both include a stress-strain recorder. National Forge and Ordnance Co. **(5-825)**

FORMICA. Illustrated general booklet telling how Formica is produced, what it is, its characteristics, grades and forms available, and showing various products made of this laminated thermosetting plastic. 16 pages. The Formica Co. **(5-826)**

PROCESSING EQUIPMENT. Four-page condensed catalog showing representative heat transfer units, blenders, and processing vessels made by Patterson-Kelley Co., Inc. **(5-827)**

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DRYCOL. Brochure describing Drycol, a blended colorant, used for accurate and economical on-the-spot coloring. Prices are included. Gering Products, Inc. **(5-836)**

PROCESSING MACHINERY. The Banbury mixer, mills, and calenders, are described in this four-page brochure. Illustrations are included. Farrel-Birmingham Co., Inc. **(5-837)**

INORGANIC PIGMENTS. Bulletin giving some of the outstanding properties of Drakenfeld inorganic pigments. Tells when used in plastics and how to incorporate them into the resin. B. F. Drakenfeld & Co., Inc. **(5-838)**

MARBLETTE. Properties, machining characteristics, stock dimensions, etc. of Marblette cast-phenolic resins. Various Marblette liquid-phenolic resins are also discussed. Eight pages. The Marblette Corp. **(5-839)**

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Consulting Economist Gilbert Jackson spoke on "Exploring the Labor Management Situation," outlining the new pattern of Canadian labor laws and labor relationships and showing the probable effects of these on manufacturing industries.

First speaker in the Technology Session, March 6, was Nelce C. Taylor, service engineer, Tennessee Eastman Co., whose subject was "Injection Molding of Cellulosics." Using slides for illustration, Mr. Taylor presented most recent information on product design for cellulosics wherein maximum advantage was taken of the strength and flow properties of materials, selection of the proper cellulosic material for the job, design of molds for cellulosic work, and injection techniques for both small and large parts.

Gordon B. Thayer, head of the molding section, Plastics Technical Service, Dow Chemical Ltd., Toronto, discussed "Research and Application in Injection Molding Polystyrene." This illustrated address covered the important Dow research on pinpoint gating and controlled flow of polystyrene during the molding cycle. The speaker showed the recommended techniques for the production of variable section and strain-free polystyrene moldings.

Product Specialist of the Polychemicals Dept., E. I. du Pont de Nemours & Co., Inc., R. E. Leary, spoke on "Advanced Techniques and Applications for Acrylic Sheets and Molding Powders." Mr. Leary stressed the importance of new techniques developed since 1945 in the fabrication of acrylic sheets.

P. O. Jeffery, asst. factory mgr., Bakelite Co. (Canada) Ltd., presented the story of "Plasticity Problems in Molding Phenolics." Mr. Jeffery outlined the use of admittedly ambiguous and specialized test procedures in the control of formulation and processing of phenolics, particularly for long run volume uses.

At the March 6th luncheon, Eric Salmond on behalf of *Canadian Plastics* magazine presented the competition awards to Canadian companies for design and production achievement in plastics during 1950.

In the "Society Reports" session, which closed the convention, L. C. McLeod, outgoing president, reported on his year's stewardship of the Association's affairs. A. E. Byrne reported as chairman of the committee on plastics of the Canadian Industrial Preparedness Committee.

Amos Ruddock, The Dow Chemical Co., reported on the activities of the S.P.I. Informative Labeling Committee, showing how the Informative Labeling Program has taken hold in the United States and outlining future projects within the program.

Ed Barringham reported, as chairman of the Tariff Committee, that a Plastics Industries Tariff Council has been set up to carry on the work and organization required in the Industry on tariff matters.

Following officers were elected to handle the affairs of the Society of the Plastics Industries (Canada) Inc. for the coming fiscal year:

President—Howard Yates, vice president and general manager, Crystal Glass and Plastics Ltd.

Vice President—A. E. Byrne, head of the Chemical Div., Canadian General Electric Ltd.

Treasurer—G. Murray Scott, sales manager, Plastics Div., Dow Chemical Ltd.

Councilor—R. T. Todd, Irvington Varnish & Insulator Co. of Canada Ltd.

If you're selling plastics to retailers, you'll get results with PLASTICS MERCHANDISING

Do you want real proof of the pulling power of Plastics Merchandising, America's only trade magazine devoted solely to selling plastics products to the nation's 55,000 biggest retail-level buyers? Then read these verbatim reports by company officials on the inquiries developed by the first issue of this powerful new advertising medium.

"CONGRATULATIONS ON A FINE PUBLICATION. RESULTS ARE MOST GRATIFYING."
President, toy company

"It is indeed a pleasure to advise you that we have received response beyond all expectations on the ad in your first issue."
President, novelty manufacturer

"I have had another batch of inquiries from that ad. They are coming in from all over the country. I would say that I have just about heard from every state in the Union . . . Your publication is really reaching the buyers . . . It's just like finding gold on top of the ground."
President, novelty manufacturer

"Our ad in the first issue of *Plastics Merchandising* pulled excellent results."
Sales Manager, plastic housewares manufacturer

"We had over 200 inquiries on the product pictured in our advertisement in your January edition. These inquiries were all followed up . . . So far 68 orders have been forthcoming."
President, large custom & proprietary molding company

"We have been besieged with initial orders from new accounts throughout the country of which many are attributed to your fine magazine."
Sales Manager, plastic film converter

". . . inquiries are still coming in. As a matter of fact, we received more inquiries this week than in any one previous week since the issue went out . . . We were very pleased with the reaction."
Advertising Manager, lighting fixtures company

"We are pleased to be able to advise you that the ad in the initial issue of *Plastics Merchandising* has already resulted in a very favorable number of replies. While complete returns on the advertising have not been reached, we have received about 75 inquiries to date."
Manager, Merchandise Div., proprietary molder of dinnerware

". . . we've been too busy around here, answering inquiries and shipping orders, to write to you sooner. I guess that's as good an answer as one could want regarding reaction."
President, novelty manufacturing company

" . . . approximately 50 inquiries . . . We are pleased with the results."
Sales Manager, toy company

"To date we have received a total of 42 replies to our ad."
Ass't Sales Manager, garden hose manufacturer

"It becomes an effort to try to catch up with the mail . . . We would like to give you further details, but please believe us, we are so busy that we cannot take time out. All in all, we are well satisfied."
President, plastic film distributors

". . . we have received approximately twenty inquiries as a result of our ad in the first issue of *Plastics Merchandising*, along with three orders and four requests for samples."
Sales Manager, Proprietary Products Div., plastics molding company

"It gives me great pleasure in congratulating you . . . The first issue of *Plastics Merchandising* has brought in many, many inquiries about our product. These inquiries have come from all over the country and Canada . . . It has opened the door to many new customers."
Sales Manager, toy company

"Complete returns are not in . . . we have had about forty requests for data equally divided between jobbers, department stores and retailers."
Vice President, plastic housewares manufacturer

"We were very pleased with the interest that was shown from a number of outlets that were entirely new to our field. It is obvious that your publication has a very strong pulling power . . . The quality of the inquiries were of the best."
Sales Manager, house furnishings manufacturer

Want details showing how Plastics Merchandising fits into *your* selling plans, reaches *your* customers and prospects . . . prepares them for *your* sales message? Drop a line *today* to Advertising Department, PLASTICS MERCHANDISING, 575 Madison Avenue, New York 22, N.Y.

PLASTICS *Merchandising* INC.

A UNIT OF BRESKIN PUBLICATIONS • AFFILIATED WITH MODERN PLASTICS MAGAZINE

Bakers' Aid

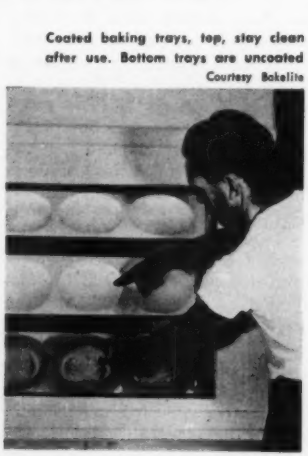
COMMERCIAL bread bakers, who have long had to contend with hard-to-remove molds and crusts which form in their dough-proofing trays, are now being offered Nukemite, a protective coating developed by Nukem Products Corp., Buffalo, N.Y. The coating, which is based on Vinylite resins, resists acids and alkalies and gives a non-porous surface to the trays.

The proofing process is used just prior to baking when individual units of dough are placed in a tray for a 15-min. rising period at room temperature. During the proofing process, the flour gluten forms a sticky mass which ferments and generates gas so that the dough becomes lighter. Dough is then formed by the molding operator into its final shape, after which it is transferred to baking pans.

Before Nukemite was used, it was necessary to place large quantities of dusting flour on proofer trays so that the dough would release immediately when the proofing process ended. Such flour-dusted trays respond very poorly to cleaning and quickly accumulate thick molds and crusts to such an extent that chipping or sandblasting is often required to remove them.

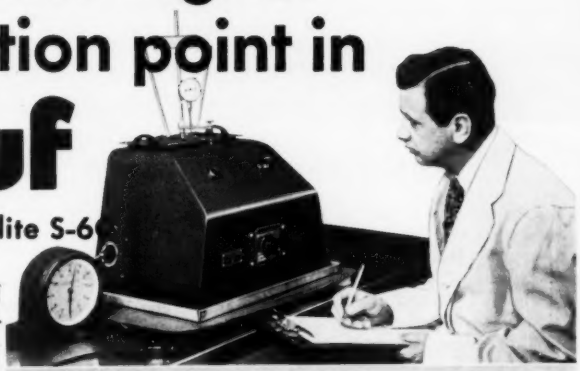
The application of Nukemite completely eliminates the dusting flour and solves a maintenance problem. The material can be brushed or sprayed onto the trays and, after use, can be wiped off with a cloth to restore the original surface.

Coated baking trays, top, stay clean after use. Bottom trays are uncoated
Courtesy Bakelite



40-50 degrees higher heat distortion point in Plio-Tuf

—made with new Pliolite S-6C

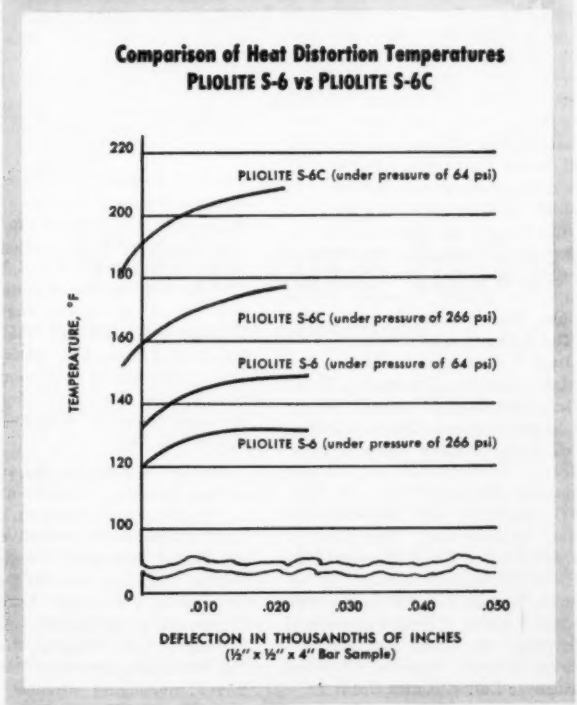


Now you can get all the advantages of PLIO-TUF—impact resistance, hardness, rigidity, chemical resistance, water resistance, machinability, good electrical properties — PLUS greatly improved resistance to distortion by heat. Thanks to a new Goodyear-developed resin—called PLIOLITE S-6C—you're assured of heat distortion points from 40° to 50° higher.

New temperature ranges in the 190°-200° F. range give you higher heat resistance in the finished item, and let your finished molded products cope with a wider range of operating conditions—yet with no sacrifice to the outstanding physical properties of PLIO-TUF.

PLIO-TUF is a use-proved combination of resin and rubber—already in full use by makers of such diverse items as helmets, textile spools, golf ball covers, carrying cases, bowling pin covers, chemical buckets and a wide range of molded items. For help in fitting PLIO-TUF into your present or future plans—samples for your evaluation—full details about this outstanding production material, write to:

Goodyear, Chemical Division
Akron 16, Ohio



HIGHER HEAT DISTORTION POINT *than with any other high styrene butadiene copolymer is shown in tests of* PLIOLITE S-6C *on Tinius-Olsen Heat Distortion Tester. Chart compares results of similar tests on* PLIOLITE S-6.

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Plio-Tuf, Pliolite—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

British Plastics Convention

THE Program Committee has published summaries of the papers to be given at the British Plastics Convention which will be held in the National Hall, Olympia, June 6 to 16, 1951.

The Convention, which is being held in conjunction with the British Plastics Exhibition, has been planned to appeal to three fields of interest: to technologists within the industry, to end users of plastics, and to the general public. Discussions will follow each paper, and participation from the floor will be welcomed. The full text of the papers, together with the discussions, will be published in a single volume later this year.

Admission to the Convention is by ticket only. Tickets may be obtained free on application (specifying sessions) to *British Plastics*, Dorset House, Stamford St., London, S.E.1

The program is as follows:

June 7. **Progress in Plastics Materials Session.** Chairman: P. C. Allen, president, Plastics Institute; chairman, Imperial Chemical Industries Ltd., (Plastics Div.), Papers: "Recent Developments in Phenolic Moulding Materials," by *J. H. Bennitt, Research and Development Dept., Bakelite Ltd.* "The Effect of Crosslinking in Vinyl Polymers," by *J. J. P. Staudinger, director of research, British Resin Products Ltd.* "Some Aspects of Solid Polymers of Ethylene," by *J. C. Swallow, research director, Imperial Chemical Industries Ltd. (Plastics Div.).*

June 7. **Plastics in the Chemical Industries Session.** Chairman: E. H. T. Hoblyn, director of the British Chemical Plant Manufacturers' Assoc. Papers: "Applications of Plastics in the Chemical and Allied Industries," by *Verney Evans, special director and chief chemist, Prodorite Limited.* "Thermoplastics in Service, with Particular Reference to the Application of Unplasticized Polyvinyl Chloride," by *J. D. D. Morgan, Materials of Construction Section, Imperial Chemical Industries Ltd. (Gen. Chemicals Div.).*

June 8. **Vinyl Formulation and Compounding Session.** Chairman: N. J. L. Megson. Papers: "Characteristics of Components and General Principles of Formulation of P.V.C. Compounds," by *H. Jones, technical Manager, Plastics Div., The Geigy Co. Ltd.; director, Geigy-Hardesty Co. Ltd.* "Production of Vinyl Plastics in Dry Powder Form," by *S. J. Skinner, sales manager, British Geon Ltd.*

June 8. **Plastics in the Textile Industries Session.** Chairman: George H. Spencer, president of the Textile Institute, chairman and managing director, George Spencer Ltd. Papers: "Textile Applications of Aminoplastics," by *A. R. Smith, chemist in charge, textile research lab., British Industrial Plastics Ltd.* "Plastics and Their Applications to Equipment in the Textile Industry," by *Alan Beecham, manager, Moulding Dept., Courtaulds Ltd.*

June 9. **Forum on Buying and Selling Session.** Chairman: Cyril S. Dingley, vice-chairman, British Plastics Federation; executive director, British Industrial Plastics Ltd. Papers: "Plastics from the Domestic Consumer's Viewpoint," by *Stanley Carter, group merchandise manager, Selfridges Ltd.* "Selling Plastics—The Manufacturer's View," by *T. L. Birrell, managing director, Halex Ltd.; director, British Xylonite Co. Ltd.* "Certification Marks and Informative Labelling," by *W. E. De B. Diamond, general manager, British Plastics Federation.*

June 11. **True Synthetic Fibers Session.** Chairman: H. V. Potter, chairman and managing director, Bakelite Ltd. Papers: "The Physico-Chemical Background of Synthetic Fibres," by *Prof. E. K. Rideal, Dept. of Chemistry, King's College, London.* "Terylene," by A. Renfrew, *director, Imperial Chemical Industries Ltd., (Plastics Div.)*

June 11. **Plastics in Building and Architecture Session.** Chairman: R. J. Schaffer, senior principal scientific officer, Dept. of Scientific and Industrial Research, Building Research Station. Papers: "The Architect and Plastics," by *Gontram Goulden, technical officer and deputy director, The Building Centre.* "What the Plastics Industry Offers the Building Industry," by *H. H. Lusty, marketing manager, Bakelite Ltd.*

June 12. **Developments in Synthetic Resins Session.** Chairman: H. A. Collinson, technical director, Leicester, Lovell & Co. Ltd. Papers: "Some Investigations into the Fundamentals and Applications of Adhesives," by *N. A. De Bruyne, managing director, Aero Research Ltd.* "Synthetic Resins as Foundry Sand Binders," by *P. G. Pentz, technical sales manager, Leicester, Lovell & Co. Ltd.* "Urea and Melamine Resins in Surface Coatings," by *F. Scholick, chemist in charge, lacquer resins research lab., British Industrial Plastics Ltd.*

June 13. **Developments in Processing Plant Session.** Chairman: J. Lionel Daniels, managing director, T. H. & J. Daniels Ltd. Papers: "Plastics Calendering—Types of Machines and Layouts," by *Joseph Brown, technical and joint managing director, David Bridge & Co. Ltd.* "Dies and Take-Off Systems for Thermoplastic Extrusion," by *Edwin G. Fisher, chief of extrusion development, R. H. Windsor Ltd.* "Basic Features Influencing the Performance of Injection Moulding Machines," by *E. Gaspar, chief designer, The Projectile & Engineering Co. Ltd.*

June 13. **Plastics in the Transport Industries Session.** Chairman: William Lyons, president, Society of Motor Manufacturers and Traders; managing director, Jaguar Cars Ltd. Papers: "Plastics in Electrical Engineering for the Automobile Industry," by *A. A. Tomkins, Joseph Lucas Ltd.* "Aircraft Plastics Structures," by *H. Warburton Hall, Royal Aircraft Establishment, South Farnborough, Hants.* "Plastics in Ship Construction," by *E. C. Leach, decorative architect, The Cunard Steam-Ship Co., Ltd.*

June 14. **Techniques of Fabrication Session.** Chairman: James But-

(*Continued on p. 149*)

* Reg. U.S. Pat. Office.

Vibrin case history

...that opens up new polyester potentials

In the dramatic history of plastics, it is difficult to single out the stars. Yet, certainly, the rise of polyester plastic resins has made one of the most exciting stories.

In the few years from 1946 to 1950, polyester sales have grown from 1½ million pounds to 7½ million pounds — a full five-fold increase!

Polyesters are taking over the manufacture of hundreds of products — tubing, fishing rods, boat hulls, trailer parts, lamp shades, furniture, stand-up screens, light diffusers, aircraft parts, many, many more. Again and again, polyesters have introduced *higher product quality* and *lower production cost.*

Just as an example, see what Naugatuck's new Vibrin polyester has done for the battery boxes produced by Lanfare Molded Products, Inc., Toledo, Ohio, for the Nu-Form Battery Corporation, Port Ch ster, Ohio. Then send the coupon below for the facts about what Vibrin can do for *your* product.

Vibrin has made battery boxes *light, strong, heat-resistant* and *corrosion-resistant.* And it can produce them more rapidly.

What's behind all this? See the notable list of Vibrin properties given here. Vibrin is a product of the Naugatuck Chemical Division of the United States Rubber Company. Insure your plastics future on the *solid base* of Naugatuck — a reliable source of quality products with which you can build lasting leadership in the years to come.

Some outstanding Vibrin properties: Easy to handle — lightweight finished products • Cures without porosity • 100% reactivity — no weight change • Electrical grades — low water absorption • Wide hardness range • Full color range • Flame-resistant types

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Division of UNITED STATES RUBBER COMPANY
NAUGATUCK, CONNECTICUT

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York
Philadelphia • **In Canada:** Naugatuck Chemicals, Elmira, Ontario

Naugatuck Chemical Plastics Division, Elm St., 25, Naugatuck, Conn.
Without charge, send technical data on properties, uses, handling methods (specify desired end products).

I understand that, from this data, I can order suitable, free experimental samples.

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MARVINOL vinyl resins • KRALASTIC styrene copolymers • VIBRIN polyester resins

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A completely new and different concept of electrically heated extruder designed for plastics materials. . . . Higher operating temperatures. . . . Lower operating costs. . . . Radiant heated. . . . Zoned as required throughout cylinder and head. . . . Even and controlled cooling. Royle Spirod Extruders have been field-tested and their stamina proved. Check these features that assure trouble-free operation —positive results.

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- Radiant heat provides steadier temperatures
- Complete insulation reduces heat loss with substantial power savings
- High watt capacity heating elements provide faster heat at lower cost
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Sinko Produces Nylon Parts That Give Years of Economical, Trouble-Free Service

Pictured are 3 Sinko Nylon cabinet rollers and a drawer skid-block that are being used successfully by several leading manufacturers of fine kitchen equipment. Sinko Nylon was selected after a series of exhaustive tests had proven its superiority in every respect. In one experiment a small drawer equipped with Sinko Nylon rollers was loaded and automatically operated the equivalent of a normal 200 years service. Upon examination the Sinko Nylon rollers showed little sign of wear.

You too should investigate the many advantages Sinko Nylon offers, among them—resistance to wear and to shock loads, to moisture, chemicals and to temperature; and its smooth-gliding, self-lubricating properties.

SINKO MOLDS ALL THERMOPLASTICS FROM 4 TO 60 OZ.

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ler, chairman of council of the Plastics Institute; chief development engineer, British Industrial Plastics Ltd. Papers: "Selection of Phenolic Moulding Materials With Regard to Mechanical Strength," by *Stanley A. Ede, technical director, James Ferguson & Sons Ltd.* "Continuous Extrusion of Thermosetting Materials," by *D. N. Davies, manager, Technical Service, Moulding Powders, British Resin Products Ltd.* "Problems of Mixing in Extrusion," by *D. Grant, Research Dept., and W. Walker, Technical Service and Development Dept., Imperial Chemical Industries Ltd. (Plastics Div.).*

June 14. **Plastics in Surgery and Medicine Session.** Chairman: H. Jackson Burrows, Dean of the Institute of Orthopædics. Papers: "Synthetic Resins and Their Internal Applications in Surgery," by *John T. Scales, Plastics Research Unit, Institute of Orthopædics; honorary registrar, Royal National Orthopædic Hospital, Stanmore, Middlesex.* "A New Method of Making Broncho-Pulmonary Casts of Human Lungs in the Fully Expanded Position," by *David H. Tompsett, Prosector to the Royal College of Surgeons of England.* "Use of Nylon Film in Surgical Dressings," by *Prof. John R. Squire, Leith Professor of Experimental Pathology in the Univ. of Birmingham; honorary director, Medical Research Council Industrial Medicine and Burns Research Units, Birmingham Accident Hospital.*

June 15. **Plastics Film Production and Handling Session.** Chairman: V. E. Yarsley. Papers: "Plastics Films—Their Manufacture and Properties," by *Maldwyn Jones, manager, Technical Service and Development Dept., Imperial Chemical Industries Ltd. (Plastics Div.).* "Heat Sealing and Welding of Plastics," by *G. Haim, general manager, and H. P. Zade, technical manager, Rediweld Ltd.* "Inks for the Printing of Plastics Films," by *Hubert A. Idle, director of research, Ault & Wiborg Ltd.*

June 15. **Plastics in Packaging Session.** Chairman: Chairman of the Institute of Packaging. Papers: "Plastics As Packaging Materials," by *G. L. Riddell, director of research, The Printing, Packaging and Allied Trades Research Assoc.* "Applications and Manipulation of Thermoplastic Materials in the Packaging Industry," by *W. T. Simpson, manager, Industrial Div., Cascelloid Ltd.*

Supercarbovar ...maximum jetness

Supercarbovar ...saves pigment loading

Supercarbovar ...saves plasticizers

Supercarbovar ...saves milling time

Supercarbovar ...low cost

Cabot's SUPERCARBOVAR produces maximum jetness at low cost to you — low in initial purchase price, and particularly low in processing cost.

Use SUPERCARBOVAR, and save on pigment loading, milling time, and on plasticizer requirements. SUPERCARBOVAR represents an optimum in particle size; small enough to impart extreme jetness, yet large enough to promote easy and complete dispersion. Because SUPERCARBOVAR has minimum absorption characteristics for a black of its intensity, it can effect economies in plastics processing that are unusual for this period.

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Designed to handle bagged products with a minimum of effort at a maximum speed. Simple adjustments for height . . . tilting forward or backward enables operator to set machine at easiest position. Stainless steel trough with capacity of 200 bags. Adjustable to bag sizes. Blower keeps bag clean and free from foreign matter.

Anderson BROS. MFG. CO.

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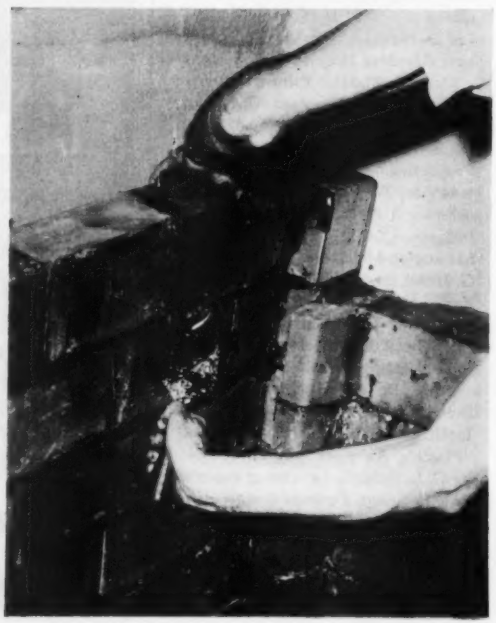
Corrosion-Resistant Cements

USE of synthetic resins in corrosion-resistant mortars or cements is not new, but recent developments in the resins have resulted in noteworthy advances. For the past 20 years a phenolic-type resin has been the most generally used bonding ingredient in such cements. The physical properties and characteristics of the phenolic resins have made these cements outstanding, but the use of them has been somewhat restricted because they were primarily acid-proof and not alkali-proof before these new developments were made.

Today, corrosion-resistant cements having both of these properties are finding wide acceptance. The reason is the development of furfuryl-alcohol resins for this application. These new resins are making it possible to manufacture cements which have as good, if not better, acid resistance than previous cements, which may be used where higher temperatures are encountered, and which are also alkali-proof.

One of the producers of such corrosion-resistant cements, Electro Chemical Supply & Engineering Co., Allentown, Pa., has developed a cement called Lecite which is both acid- and alkali-proof. This cement consists of two basic parts—a liquid binder containing a Durez resin, and a powder containing filler and a setting agent. Lecite is said to be inert to all acids, organic and inorganic, except for a few strongly oxidizing chemicals, to most organic solvents, and to all alkalis of any concentration.

Laying up chemical-resistant brick as a tank liner, using corrosion-proof cement, and using ordinary brick-laying procedure



It will withstand temperatures to 370° F.; and is so dense that salts cannot penetrate and crystallize within a joint. It has a reported tensile strength of 1000 p.s.i. and a compressive strength of 10,000 p.s.i. Lecite sets quickly by chemical action yet has sufficient working time to avoid waste. In an unmixed state, it may be stored for an indefinite period of time.

Corrosion-resistant cements such as this are desirable for use in plants producing textiles, steel, phenol, paper, dairy products, food products, alcohol, nylon, soap, copper sulfate, acids, organic chemicals, and many other products. They are used in those plants, for example, in brick-lined pickling tanks, storage tanks, fume stacks, absorption towers, and waste-neutralization tanks. In one plant, for example, a brick-lined reactor is handling a mixture of hydrochloric acid and organic solvents at an operating temperature of 350° F. and a working pressure of 40 p.s.i. In another, dilute sulfuric acid at 70 lb. steam pressure is passed through a digester.

As development work with these new furfuryl-alcohol resins is continued, improvements are being made in impact strength and shrinkage properties, and in adhesion to ceramics, concrete, metals, glass cloth, and rubber. One of the newest uses is in an impervious membrane reinforced with glass cloth. This is serving effectively not only as a lining but also in some instances by itself in formed shapes.

In the construction of acid- or alkali-proof tanks and similar equipment, special consideration must be given to a number of factors such as the design of outlets, covers, and supports; the method of heating; and the supporting shell. The two most commonly used exteriors are made of welded steel or reinforced concrete. Either must test liquid tight and function as a rigid support for the acid-proof brick lining.

Reinforced concrete or steel tanks and similar equipment must be lined with an impervious membrane before installing the acid-proof brick lining. The primary purpose of the acid-proof brick lining is to provide thermal and mechanical protection for the impervious membrane. Impervious membranes consist of rubber, synthetic rubber, vinyl-type resins, asphalt-resin compositions, glass cloth reinforced infusible resins, and lead. The final selection depends upon the chemicals being handled, maximum temperature during operation, and the type of supporting shell being used. The selection of the proper cement to join the brick lining depends upon: 1) chemicals involved in the process, and concentration of each chemical; 2) maximum temperature of solution or gas; 3) thermal shock; 4) abrasion. The thickness of the brick lining is determined by the dimensions and shape of the unit, the temperature of the solution, and the type of membrane used.

In those plants where an acid-proof brick or tile floor is desired, the new corrosion-resistant cements also have an important role. In this type of construction, an impervious membrane is used between the concrete sub-base and the acid-proof brick or tile. It has proved to have excellent wear-resisting properties and is capable of withstanding severe traffic.

Although these cements are not in relatively widespread use, manufacturers believe that continued development and research by the resin producers and themselves will result in still further improvements which will broaden the scope of the cements even more.

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Self-Adhesive
MASKS & STENCILS
...A Fool-Proof Short Cut on Precision RUSH Jobs!
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ANY SIZE . . . SHAPE . . PATTERN
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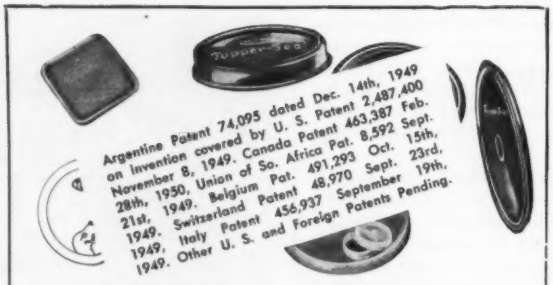
3-167 GENERAL MOTORS BLDG. TRINITY 5-5781

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.



Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950, Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Other U. S. and Foreign Patents Pending.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER /

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

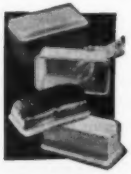
Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

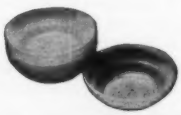
TUPPER CORPORATION

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Pour Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.



When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

TUPPER CORPORATION

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas New York Show Rooms 225 Fifth Ave.

ADDRESS ALL COMMUNICATIONS TO: Department B

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PORTABLE DIAL SCALE

This portable Toledo controls costs in a great variety of applications. Sturdily built to maintain precise weighing accuracy. Rapid automatic weight indication. Wide choice of dials. Capacities to 1600 lbs. Send for bulletin 2025. Toledo Scale Company, Toledo 1, Ohio.

Portable Scale for weighing at bench level heights. Shown with adjustable wheeled stand and with a packing house pan.

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60 years of manufacturing experience.

Write us and tell us your application and we'll submit samples for your inspection and approval.

THE O. HOMMEL COMPANY

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"12 times the wear of special heavy duty gloves"

"Save 90¢ per man per work day"

"2/3 the cost of former gloves"

"Last 8 times as long as ordinary gloves"

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JOMAC WORK GLOVES

Whatever your problem, hot or cold materials, oily tools, sharp dies, rough objects, there is a Jomac Work Glove to give you better hand protection at a saving. Jomacs are the loop-stitched gloves with extra protection built in.

They are reversible—any two gloves make a pair. They're washable, no need to throw away dirty gloves. Use coupon below for trial order.

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Type 25

Perfect for Plastics

HOLTITE THREAD-CUTTING SCREWS

Type 23

Fasten plastic parts with screws specially designed for the purpose!

Notice the large slot that creates an acute 70° cutting edge and ample chip cavity. In action, the chips are deflected toward end of screw away from the cutting edge, thus preventing chip interference. By cutting clean, perfect mating threads in plastics, internal stresses are held down, and fracture hazards are minimized even in brittle materials.

SPEED UP ASSEMBLY — REDUCE COSTS

Ideal for fastening both thermoplastic and thermosetting materials, HOLTITE Thread-Cutting Screws reduce the cost of molded parts by saving molding time, thereby decreasing the time cycle, and eliminate the cost of tapped metal inserts. In addition, assemblies are fastened tighter and stronger to insure trouble-free performance.

For every plastic fastening requirement, specify HOLTITE Type 23 or Type 25 Thread-Cutting Screws. Save time, reduce costs and improve your assemblies.

CONTINENTAL SCREW COMPANY

New Bedford, Massachusetts, U.S.A.

THE ELEMENTS THAT MAKE FOR LIGHT MANUFACTURING SUCCESS ARE PRESENT IN

EL PASO

An ample supply of natural gas and electric power at reasonable rates, plus competent labor of many different kinds, and desirable climate and living conditions are factors that are important in any decision affecting plant location in the plastics industry, as they are in any light manufacturing operation. These factors, and many others besides, are present in El Paso, Texas. General conditions are outlined factually in our new industrial book, and a copy is ready for you upon your request; we will also undertake to develop specific facts that will be helpful to you.

THIS FACT-FILLED BOOK IS YOURS FOR THE ASKING

WRITE:

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SPECIAL SIZES MADE TO ORDER

Less expensive than any other sets on the market— yet specially processed of a special steel to give top quality, maximum usage and efficiency!

COMPLETE SETS from stock on standard sizes . . . on others, our usual speedy service prevails.

INDIVIDUAL PIECES supplied to match your present stock.

REPAIRING AND REGRINDING done to your specifications on your present punches and dies.

WRITE TODAY for full details!

ButtOndeX CORP.

"Your Problem is Our Product!" • 386 Fourth Ave., New York, N.Y.

Photos courtesy Bakelite

Base and removable tray of polyethylene case hold tools in shaped compartments

Tool Case

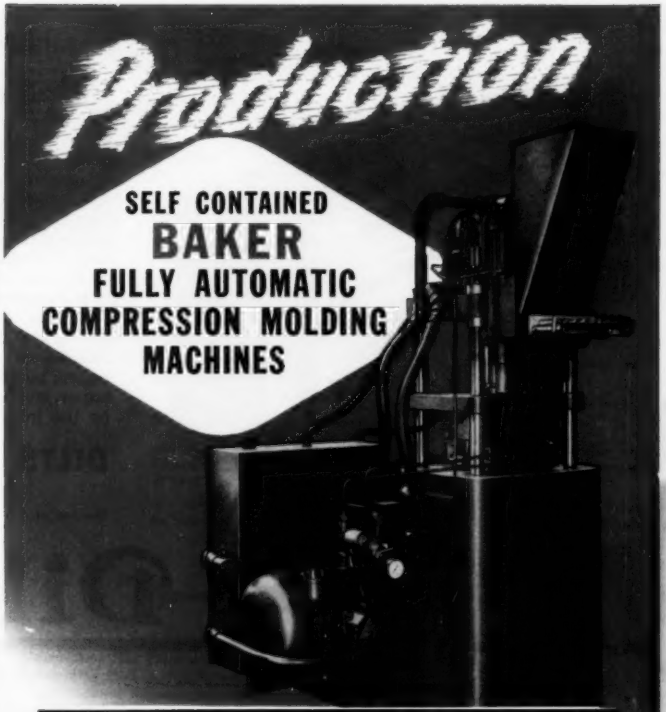
PRECISION tools stored in a new type of polyethylene box that is light, compact, and durable are protected against moisture and careless handling. The flexible case is molded of Bakelite polyethylene which is resistant to abrasion, moisture, oil, grease, and most chemicals. Pro-Phy-Lactic Brush Co., Florence, Mass., molds the case, which has a hinge molded-in as an integral part of its construction.

Five lb. lighter and 50% smaller than a conventional container of the same capacity, the case holds 39 pieces of a popular size tap and die set in the molded-to-shape compartments of its base and removable tray. A table listing the sizes of taps, with the drill sizes to be used, is molded in the inside cover.

Table listing tap sizes and drills to be used is molded-in inside the cover

Production

SELF CONTAINED
BAKER
FULLY AUTOMATIC
COMPRESSION MOLDING
MACHINES



Typical Application for Baker Automatic Press

Part After Assembly

AUTOMATIC PRODUCTION AS REQUIRED

With the 15 ton Baker Automatic, total cycle time for multiple cavity operation on this 3 ounce piece is only 40 seconds. This includes metering of charges, loading, cure time, ejection and flash cleanout.

Mr. Ray Blakeman, president of the Blakeman Electrical Mfg. Company of Los Angeles, says . . . "We have thus opened the bottlenecks of long delays in deliveries of our porcelain components. When we plan an assembly run of an item, we can install the desired die in the Baker and be in production of the Alkyd insulators and mounts within two hours; and we need mold only enough parts to complete our assemblies. The simplicity of the Fully Automatic Baker Press and the use of Plaskon Alkyd powder combine to make a perfect production team in our business, and they have certainly relieved us of a major production headache".

CLOSURE . . . 400 inches per minute with ALKYD

ALSO SLOW SPEED FOR PHENOLICS, UREAS, MELAMINES

Baker Brothers invite comparison of their closure speed of 400 inches per minute, their large platen area and overall cycle time of 4 seconds plus cure with any other machine for Alkyd materials now on the market. Actual records of specific parts show the machine to be capable of multiplying production by as much as four times with lower initial investment due to the fewer die cavities required . . . and at correspondingly lower daily production cost. The machine is available from stock in both 15 ton and 30 ton models with 8 cavity feeder. Floor area: 56" x 25" for either model. Send for details . . . now!

BAKER BROS., Inc., Toledo, Ohio

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California Representative:
West Coast Plastics Distributors, Inc.
2255 Stone St.
Los Angeles 58, Calif.

BAKER BROTHERS, INC.
TOLEDO, OHIO

Send more information on the Baker Fully Automatic Compression Molding machine to:

Name _____

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embossing in line with other converting machines

The Dilts embosser is especially suitable for in-line operation with printing presses, coaters or bag machines.

It is compact—minimum floor space. Loading system enclosed in base yet readily accessible.

It is rugged—High capacity roller bearings and heavy duty construction throughout reduces down time and maintenance to a minimum.

It is controllable—Fully controlled from operator's side. Push button control of roll loading and unloading.

Available—embossing machines by Dilts for paper, board, foil, or film, with rollers of steel-paper, steel-rubber or matched steel as required by the job.

DILTS MACHINE WORKS
FULTON, NEW YORK
Division of The BLACK-CLAWSON COMPANY, Hamilton, Ohio

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designs for production profits

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REZ-N-BOND

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LUCITE, PLEXIGLAS and POLYSTYRENE!

Water-white non-inflammable REZ-N-BOND is the ideal bonding agent for polystyrene as well as Lucite, Plexiglas and all other acrylics.

REZ-N-BOND sets ***instantly*** and is ready for finishing operations within an hour. It produces perfect, ***optically clear joints*** as strong as the plastic itself. REZ-N-BOND is also available in 22 beautiful colors.

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Schwartz **CHEMICAL CO., INC.**

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INJECTION – COMPRESSION PLUNGER and TRANSFER

Considerate and experienced handling of your plastic molding problems is available thru our accurate service, where you will find ample facilities to meet your every plastic molding requirement . . . at maximum efficiency and economy. Accurate invites your toughest problems, offering a complete service for molding thermoplastic and thermosetting materials. Our entire engineering and technical knowledge is at your command . . . NO OBLIGATION.

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ACCURATE MOLDING CORPORATION 35020 48th AVENUE LONG ISLAND CITY 1, N.Y.

Acrylic visor keeps crash helmet from blowing off head when pilot bails out

Helmet Visor

PROTECTION of airplane pilots has advanced another stride with the development of a spherical acrylic visor designed to virtually glue a flier's crash helmet to his head when he bails out at speeds above 500 m.p.h. Heretofore, the air blast would tear the helmet from the pilot's head and thus rob him of his oxygen equipment that is so essential at high altitudes.

The Plexiglas visor—a joint project of Bausch & Lomb Optical Co., Rochester, N.Y., and Air Materiel Command—is rivetted to the helmet on either side, and when pulled over the flier's eyes, it locks in place, preventing up-rushing air blasts from tearing off the helmet. When not in use, it can be pushed up out of the way. The green-tinted visor also acts as a sun glass and to protect the pilot's eyes from air blasts.

The visor is used with an improved helmet—called the P1A—consisting of a tough, light-weight, outer shell of cotton duck treated with phenolic resin and lined with sponge rubber to reduce shell resonant noises. It is fitted to the head by an adjustable sling suspension of nylon webbing. Although it weighs only about 2 lb., it will withstand 64 ft.-lb. of impact. Other features are an adjustable neck strap that stabilizes the helmet and a permanently attached throat strap.

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for LAMINATING and MOLDING

high pressure • low pressure

PHENOPREG LP SPECIAL RESIN TREATED FIBERGLAS FABRICS

• Supplied ready for dry lay up and curing under heat and pressure without further processing by the purchaser.

• For aircraft parts requiring high strength/light weight ratios. Electrolytic corrosion resistant and flame resistant formulations available.

• Especially suitable for fabricating drill jigs, routing fixtures and other production tools for the aircraft and allied industries.

• Can be laminated at pressures of 15 psi and upward. Cure temperatures of 250° F. are recommended.

• Polyester and allyl polymer resins are used in conjunction with a variety of glass fabrics.

PHENOPREG materials are resin impregnated papers, fabrics and Fiberglas cloth and mat for laminating and molding by the application of heat and pressure.

We invite your inquiries on standard and special PHENOPREG materials. Ask for a sales engineer to help with your technical problems.

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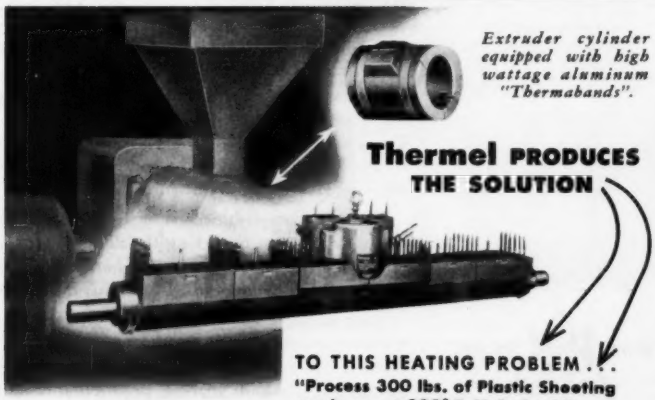
PLASTICS DIVISION

Main Office 1721 Pleasant Ave. • River Rouge 18, Mich. • Vinewood 1-8200
Manufacturing Plants: River Rouge, Los Angeles • Sales Offices: New York, Chicago
Canadian Representative: Plastic Supply Company, Montreal, Toronto



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Our client specified a long life, high production capacity heating unit for conventional temperatures (Polyethylene), plus the ability to handle any higher temperature plastic known or projected.

Die length 70". "Thermatubes" cast in aluminum bronze. (Terminal boxes not shown.)

Detailed information on request.

Thermel, inc.

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Phone NEvada 2-2323

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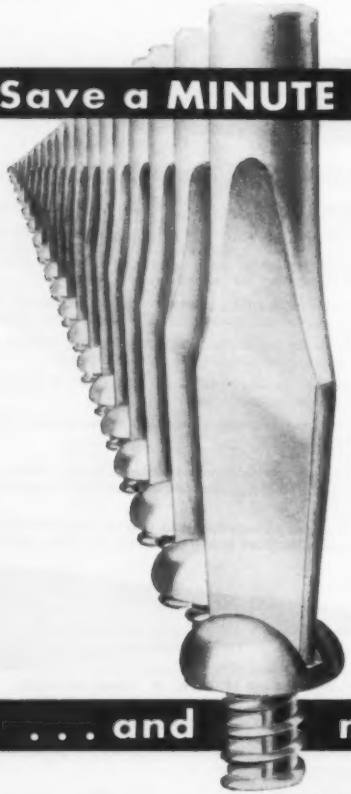

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BOLTS, NUTS AND LOCK WASHERS

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MACHINE SCREW IN TAPPED HOLE

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RIVETING IN HARD-TO-REACH PLACES

here

MACHINE SCREW IN THREADED INSERT

. . . and multiply it by MILLIONS!

A simple idea — Self-tapping Screws — originated 35 years ago by Parker-Kalon — becomes more important to industry every day.

The idea is simple—hardened screws that will drive into metal or plastics just as wood screws drive into wood—to save the time and equipment required for tapping, riveting, and nut-running.

But its accomplishment is far from simple. The foundation of P-K leadership was its success in mastering the difficult problem of mass-producing screws possessing the proper balance of hardness and toughness. It is the reason the names Parker-Kalon and Self-tapping Screws are synonymous today.

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Your savings with P-K Screws—at each fastening point—are measured in minutes or less. But these minutes—multiplied by millions of fastenings—mount rapidly. They *total* a big saving—a saving you can't afford to overlook with production demands soaring, production costs at an all-time high, and with a squeeze on profits.

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The Original

PARKER-KALON® SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

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Precision Plastic Molding VICTORY would do the job *COMPLETE!*

Put Victory's *complete* facilities to work for you . . .

- ENGINEERING—Victory's staff of engineers includes specialists in the mechanical, electrical and chemical fields.
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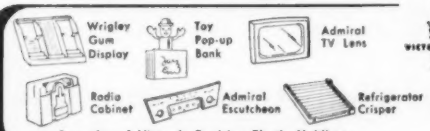
- FINISHING—Victory's up-to-date automatic paint spraying, hot stamping and silk screening equipment gives you custom-finish jobs at production line prices.
- ATTENTION: SALES ORGANIZATIONS—Victory will manufacture and package your product, individually and in multiple-unit cases, preparing it for immediate shipment to your customers.

"All operations under one roof" saves you time, effort and money. Let us help you with your thinking. Contact us NOW!



Examples of Victory's Precision Plastic Molding

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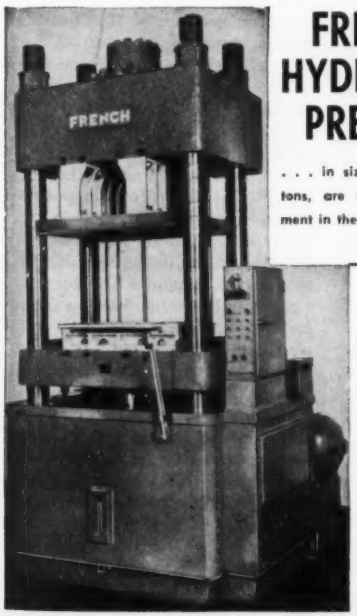
ESTABLISHED IN 1930

Up to 60-ounce Shots



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. . . in sizes up to 1,500 tons, are standard equipment in the plastic industry.

Write for our catalog

THE FRENCH OIL MILL MACHINERY CO.
(HYDRAULIC PRESS DIVISION)
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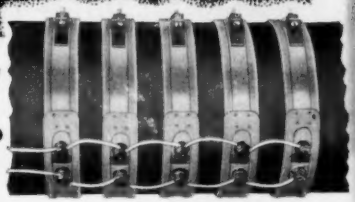
better PLASTIC PRODUCTS Begin with *better* HEATING UNITS

WATLOW NARROW BAND HEATING UNITS



EFFICIENT HEAT TRANSFER . . . High heat concentration of 35 to 45 watts/sq. in. Compact, thin, light-weight construction permits closer temperature regulation; eliminates costly temperature lag.

FEWER BURNOUTS . . . High dielectric strength means less cross-section of insulation—resulting in shorter path of heat, lower internal operating temperature, longer life.

QUICK, LOW-COST REPLACEMENTS . . . Easily replaced one unit at a time . . . with only fractional heat loss.

BETTER FITTING UNITS . . . Relatively low expanding metal band keeps unit firmly clamped to surface at all temperatures for steady, constant heat.

SEND for Watlow Catalog—gives valuable heating information on Strip, Band, Cartridge, Immersion Heaters.

SPECIALISTS IN ELECTRIC HEATING UNITS

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ELECTRIC MANUFACTURING COMPANY

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WAITING
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PLASTISOLS
FOR MOULDING
OR COATING

ORGANOSOLS
FOR FABRIC OR
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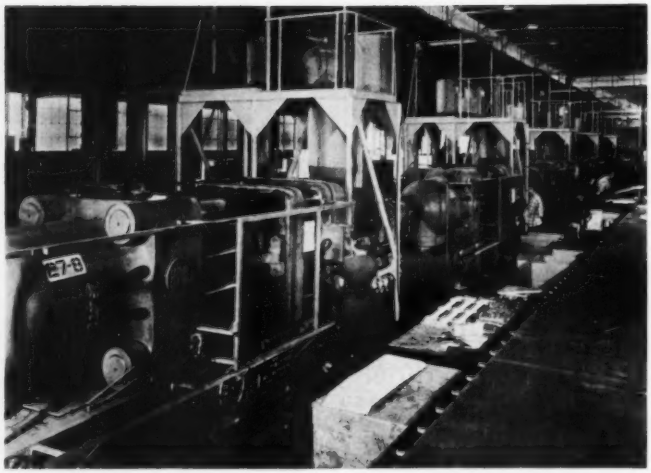

Five 60-oz. machines are part of huge production line for injection molding. Gates are cut, scrap reground at machine. Parts go to shipping room on conveyor belt

Biggest Injection Production Line

IN a new plant for injection molding recently completed by General American Transportation Co. at East Chicago, Ind., is a straight production line stated to be the world's biggest for turning out large injection molded parts. The photograph above shows a section of this line, consisting of five 60-oz. machines designed and built by The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.

The injection machines are set up in a straight line parallel to a large conveyor belt which is used to deliver the molded parts to the shipping room. The majority of the parts molded on this equipment require only gate cutting as a finishing operation. This is accomplished at the machine. The operator also regrinds sprues and runners at the work station or, if this scrap is of the proper size, feeds it back into the machine. Thus the conveyor carries only finished parts, which are ready to be packed at the end of the conveyor belt's run.

This simplicity of finishing operations is often rated as the greatest single factor in the tremendous acceptance of injection molded thermoplastics. Production is fast, materials are stable, color ranges are practically unlimited, and the ease of finishing keeps labor costs to an absolute minimum.

Each of the giant H-P-M 60-oz. machines on the General American production line weighs over 100,000 lb. and is capable of exerting a clamping pressure of 1000 tons. Injection pressures up to 20,000 p.s.i. are possible. Despite the complexity of the work which these machines perform, they incorporate features which permit molding cycles of less than 1 minute.

The hoppers with which these injection machines are equipped are designed to accommodate a full drum of thermoplastic molding material at one filling. At present, although the machines are not running at full capacity because of the current material shortages, the plant is still turning out a large volume of injection molded parts.

Typical parts now being molded in the General American plant include television windows and bezels and such parts for household refrigerators and freezers as door panels, humidifier drawers, and large breaker frames. One such frame, previously produced in four sections, is now being molded in a single piece, resulting in a substantial saving in assembly costs. Such parts are a far cry from the simple knobs, dials, etc. of only 15 years ago, when 2-oz. pieces were considered to be "large" injection molded parts.

THE Jacques UNIVERSAL SHEAR

For all light materials requiring accuracy and top production performance. In 30" to 60" sizes. Write for illustrated folder.

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25 Salisbury St. Worcester 5, Mass.
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manufacturers of:
JACQUES Hand and Power Shears,
TRI-POWER Die Presses, Paper Box Machinery, and
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DRY COLORS

COLORS FOR PLASTICS

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Organic Red, Maroons
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Offerings based on extensive experience with leading plastics manufacturers

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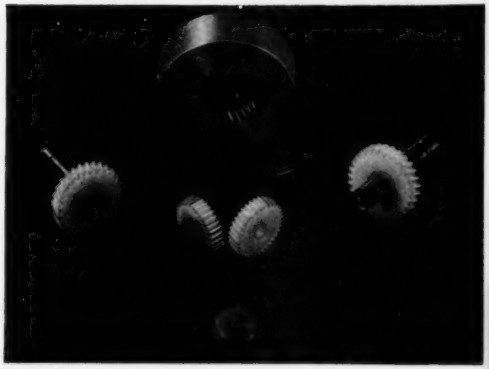
QUALITY...
DOESN'T COST
...IT PAYS



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PRO-PHY-LAC-TIC BRUSH COMPANY CANADA LTD.
on the occasion of your top award in the Canadian Plastics 2nd Achievement Award Competition.

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Helical gears molded in Nylon from BERYLLIUM COPPER

•

TRU-CASTINGS made this precision mold A WINNER

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Only MANCO gives you BERYLLIUM COPPER castings of distinction that are Precision Engineered for Long Service—made for Exacting Production Schedules—and Tailored to your Specific Needs.

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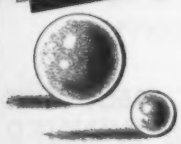

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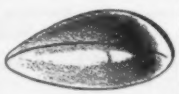

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Plastics Aid Diamond Studies

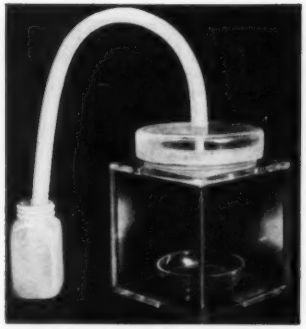
THE resistance of styrene and acrylic to hydrofluoric acid has made these two plastics invaluable in diamond investigations where it is frequently necessary to allow rough stones, samples of diamond-impregnated tools, or powder to stand in contact with cold concentrated hydrofluoric acid for several days.

As a rule, platinum dishes are used to hold the hydrofluoric acid, but this is not desirable because the platinum is tied up for long periods of time and, more important, in the case of a large diamond which must be placed in a safe overnight, it entails the removal of the acid each night and the consequent protraction of the reaction period. By using a plastic container with a tight-fitting lid, the platinum dish containing the diamonds or diamond-bearing materials can be placed in this vessel and locked away in a safe without danger of the vault being attacked by acid fumes.

Two alternate materials can be used for this container—styrene and acrylic. The most suitable container is of transparent styrene machined from a solid block and provided with a screw-top lid to allow a large platinum dish to be placed inside the container. In the center of the lid a small styrene tube with an outside diameter of $\frac{7}{16}$ in. projects $\frac{3}{4}$ in. above the surface. For most work a small styrene cap fits snugly over this tube to prevent the escape of acid fumes from the container.

When the sample contains much material which reacts with hydrofluoric acid, a short length of polyethylene tubing having a bore of $\frac{7}{16}$ in. is slipped over the open outlet tube and led into a bottle containing sodium hydroxide. The sodium hydroxide can be in the form of either pellets or a solution, and it acts as an absorbent to entrap acid fumes carried over when they and other gaseous reaction products are released through the outlet tube.

These containers can also be fabricated from sheets of transparent acrylic. They are more easily and cheaply constructed than when machined from styrene, and have been



Polyethylene tube leads from acrylic container to fume absorbent in bottle

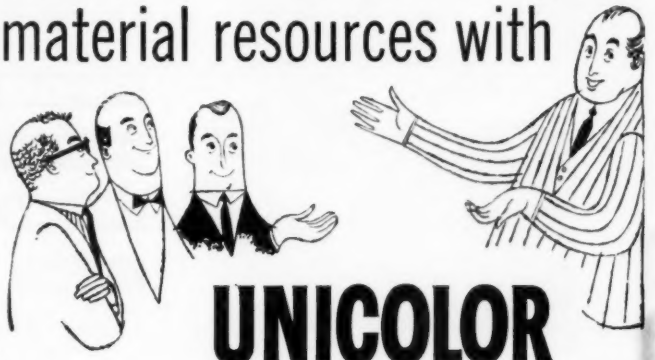
found quite satisfactory. The acrylic, ¼-in. sheets of Perspex supplied by Imperial Chemical Industries, Ltd., is formed into a container measuring 5½ by 5½ by 5½ in., with cemented joints. The square vessel is provided with a screw top lid, also of Perspex, which has an outside diameter of 5½ in. and a height of 1 in., giving an opening in the top of 4 inches. An outlet tube in the lid, similar to that described for the styrene container, is provided.

Acrylic becomes rubbery and milky in contact with liquid hydrofluoric acid, so if the latter is spilled from the platinum dish into the container, it should be rinsed off at once. However, the acrylic is not apparently affected by the fumes of hydrofluoric acid under ordinary conditions, and the Perspex container is quite satisfactory for this.

If it is not necessary to heat the diamond sample, or treat it with a mixture of hydrofluoric and other acids, a dish made from transparent styrene, approximately 3½ in. in diameter and 1¼ in. deep, can be used in place of platinum. This dish, containing the cold hydrofluoric acid, can be transferred to and from the box with the aid of platinum-tipped tongs in the same manner as a platinum vessel.

Polyethylene has also been used to make the dish, but as this material is not transparent, it is not as suitable, since it is often desirable to see the progress of reaction without removing the sample from the dish.—*R. S. Young, director of research, Industrial Distributors (1946) Ltd., Johannesburg, Union of South Africa.*

how you can husband your material resources with



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Q. How does Unicolor work?

A. Unicolor comes to you in granular or pellet form. It forms a molecular bond with the thermoplastic you use; it fuses and combines with it into a molecular blend that distributes the color uniformly throughout the mass.

Q. Are special skills, special machinery needed?

A. No. Any operator can mix Unicolor without special equipment or special know-how. Coloring and molding are simultaneous. No more material need be prepared than a specific job calls for. One simple weighing, and you get the correct proportion of pigment to uncolored resin. (1 part Unicolor to 24 uncolored resins for electrical insulation and general purpose extrusion; 1 part Unicolor to 6 parts uncolored for injection molding; proportions of specially compounded Unicolor to uncolored vary for streak-free thin film.)

Q. Does Unicolor create new production problems?

A. No. Unicolor does not affect the physical or chemical properties of the plastic it is used with; it does not interfere with normal extrusion rates; it does not produce blemishes or blisters; it does not mottle or streak or bleed. Unlike dry powders, it does not fly and contaminate other machines. It cannot clog screens.

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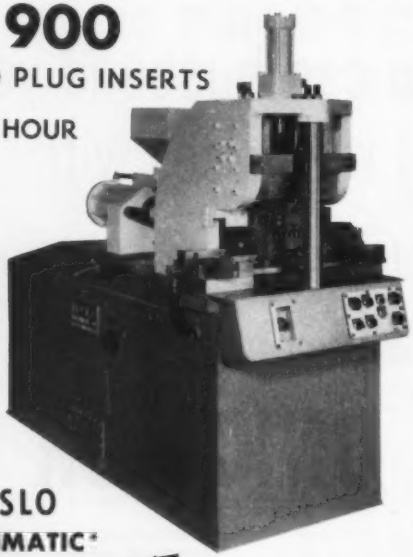

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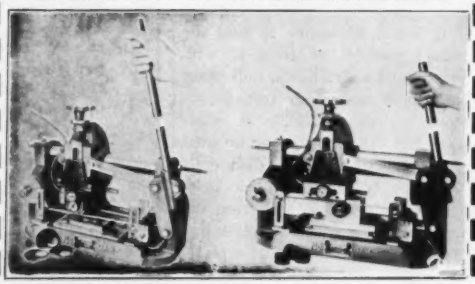

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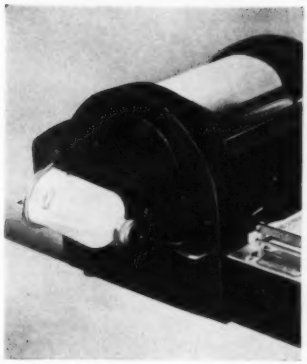

Polyethylene bottle for dup'icator ink removes one cause of poor reproduction

Duplicator Bottle

ONE of the most frequent causes of service repairs on duplicating machines—faulty ink containers—has been eliminated by one company through the adoption of a polyethylene bottle in place of the glass container previously used. With the glass bottle, the neck was often chipped slightly by operators during refilling. This produced air leakage at the point where the container connects to the hose feeding fluid to the machine, causing fluid to flow unevenly and spoil the duplicated copies, as well as interfere with efficient operation.

To overcome this minor operating difficulty on its machines, Rex-O-Graph, Inc., Milwaukee, Wis., decided to shift to plastics. Selected for the task was the 16-oz. Boston Round type polyethylene bottle manufactured by Plax Corp., Hartford, Conn. This is a natural-colored, semi-transparent Plaxpak container through which the fluid level of ink is visible. The Rex-O-Graph trade-mark is printed around the base of the bottle.

The Plaxpak bottle cannot be chipped, and thus always provides a perfect seal. In addition, the plastic bottle is relatively soft and will not ridge the rubber gasket against which it rests at the hose connecting point. Such ridging had been a further source of air leakage when glass was employed. Rex-O-Graph also chose the polyethylene bottle because it will not break if accidentally dropped or struck against the side of the machine.

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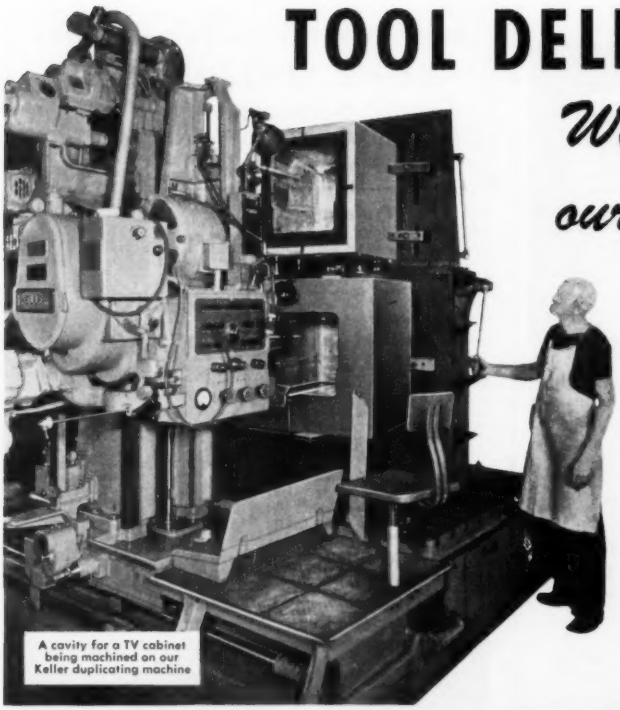

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Static Dust

(*Continued from pp.* 95-106)

commercially available destaticizers indicated that this process was not feasible. There was apparently too much wiping action exerted by the hot plastic being injected into the cavities for the thin layer of destaticizer to withstand, and certain areas of the tile molded in this manner had objectionable dust accumulations, even though an application of destaticizer was made as often as every fifth shot.

Spraying the granules with this same material before molding proved much less effective than spraying the mold itself. Objectionable dust deposits were noted all over the tile on most of the shots thus made.

Internal incorporation of 2% of a commercial destaticizing ingredient, which changed the crystal clear polystyrene to amber color, resulted in tile that did not collect dust in the originally molded state. However, after they were washed with water, they too had objectionable dust deposits all over their surfaces.

Polarity and Magnitude of Charge

A good deal of the work done in the past on polystyrene's dust collecting ability involved an attempted correlation between static dust pickup and electroscope or electrometer readings. Repeated attempts were made to correlate dust pickup tendencies with the amount and sign of the charge. Statements have even been published to the effect that certain destaticizing treatments "change the sign of polystyrene's charge and thereby repel dust particles." The work done to date indicates that there is no truth in such claims. This work has also shown that electrometer readings are valuable only when obtained and interpreted by a person completely familiar with the use of the instrument. In this respect the situation resembles that of crossed Polaroids which can be used constructively to indicate certain conditions within a plastic molding, but which can be misused by the novice to indicate conditions that do not exist.

Thus it is that a "neutral" condition on a molding might be indicated by an electrometer and might well be interpreted to mean that no dust will collect on that molding. The fact might be that a very high positive and negative charge, existing side by side, are balancing each other as far as the instrument is concerned, and that unusual and heavy dust deposits might be expected in both areas.

Most wall tile have come directly from the mold with a predominantly negative charge, only a few with a predominantly positive charge. In almost every case the tile, if examined closely enough, have been found to have both positive and negative charges existing at random over their surfaces with one or the other predominating in an overall reading. As a matter of fact, dust particles themselves, including those consisting of finely divided carbon black, sifted Pocahontas ash, short wool fibers, short rayon fibers, and natural "house" dust, appear equally attracted by positive or negative.

In order to develop more accurate

Fig. 6—Effect of mold lubricants on dust collection. Left: Normal amount of proprietary mold lubricant used. Right: Excess of same lubricant (lubricant visible as blemishes)

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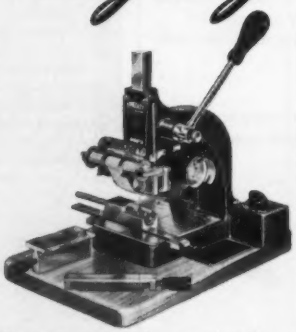

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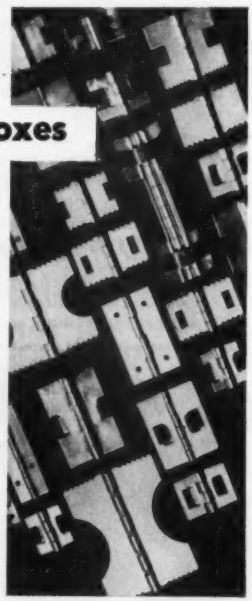

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HINGES

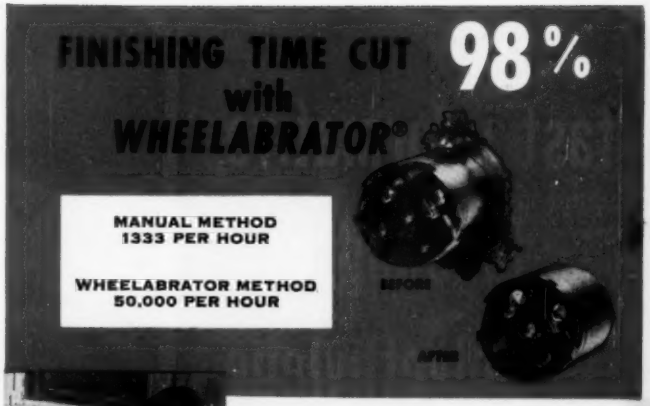
information on the size of the charge necessary to create branched patterns, an alternating current potential was applied to the surfaces of various tile by electrodes of varying design, and the tile were then dusted. The conclusion was reached that small branched patterns of the "sandbur" variety could be created by the application of 5000 v., but in all probability 10,000 v. or more would be necessary to create the large, elaborate, multi-branched patterns seen in some of the photos.

The presence of positive and negative charges side by side in finely divided patterns is well illustrated by allowing a small ball of carbon black to roll onto the level surface of an untouched polystyrene tile. The carbon ball picks up a charge in rolling onto the surface, whereupon it is attracted to an area on the tile which has an opposite charge. Upon contacting this area it is immediately discharged and, upon taking the charge of that area, is again attracted to the next area of opposite charge. The ball thus continues to jump around in rapid motion for a short time, and in so doing leaves a trail of soot that often serves to outline the general location of a branched pattern. By this technique it has been possible to establish the fact that each small arm or branch on a branched pattern has a definite charge, and that the areas around and between the branches have an opposite charge.

Strikingly colorful and convincing proof of the existence of positive and negative charges on polystyrene can be demonstrated by still another technique. By blending two specially prepared fluorescent powders and then dusting the mixture on the surface of a molding, it is possible to define the exact location of positive and negative charges and, in a rough manner, indicate their magnitude as well. The separation of the dust components from the mixture is accomplished by the preferential attraction of the red-colored powder to negatively charged areas and the green-colored powder to positively charged areas.

The "black light" colored photographs reproduced on p. 100 show the results of this two-color dusting. The red dust usually predominates in total area covered and hence the tiles as a whole show a negative

(*Continued on p. 174*)



at SMITH & STONE LTD.

Smith & Stone Ltd., Georgetown, Ontario, installed a Wheelabrator to replace conventional manual finishing methods, for deflashing compression molded plastic parts. Production on the socket shell, illustrated above, zoomed from 1333 pieces to 50,000 per hour. Similar production gains resulted in processing scores of other plastic parts.

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Wheelabrating — an exclusive American process — removes flash by pelting the parts with millions of small, nonabrasive particles capable of reaching into the most inaccessible places without any damage whatever to the part. More than 50 Wheelabrators are already in service in the Plastics industry.

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Polyethylene is the meanest of plastics to label. Beckman Instrument Co. of South Pasadena, Calif. not only use Kum-Kleen pressure-sensitive labels to solve this difficult problem, but to greatly decrease labeling labor cost as well! For almost a decade, Kum-Kleen labels have been the answer to the problem created by difficult-to-label surfaces, for Kum-Kleen labels, with their unusual adhesive qualities stick-and-stay-stuck to all smooth surfaces, never pop or curl even when subjected to extreme changes of temperature. In the example illustrated above, Kum-Kleen labels do the even more difficult job of labeling a curved Polyethylene surface!

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charge. However, positive charges of very high potential exist in the branched patterns and in some "smeared" and "spotted" areas shown up by the green dust.

It can thus be seen that a careful "scanning" exploration of the entire polystyrene surface must be made with a highly directional electrostatic voltmeter if an accurate interpretation of charge and polarity is to be made. Areas having static charge of a relatively mild nature are almost sure to collect dust in some form; whereas very strong positive and negative charges existing in close proximity are sure to have unusual and well patterned dust deposits.

Dust Collection on Other Plastics

Polystyrenes of several types and from several sources were evaluated in this program. Included were some lubricated and unlubricated materials, as well as high heat-resistant and high-impact strength formulations. Polystyrene, as a class, was found to be the worst offender, from the standpoint of dust pickup, of all the plastics tested. The patterns were always well defined and prominent. They consisted, either singly or in combination, of branched patterns, relatively large smeared areas, or relatively small concentrated lines or spots.

Next in relative seriousness of dust pickup came polymethyl methacrylate and polyethylene. On occasion they had a few relatively small branched patterns but generally their deposits consisted of spots, streaks, and smears, with what looked like "shrink bubble" marks on their surfaces. In no case did methacrylate or polyethylene exhibit as pronounced a tendency to pick up dust as did polystyrene. Their patterns were quite definite but, in general, did not have either the fine detail or the amount of dust visible on polystyrene. Unlike polystyrene, these two materials showed almost no tendency to collect dust in aggravated patterns or amounts when they were rubbed with the intention of creating an artificial static charge.

The other thermoplastic and thermosetting materials tested in this series include ethyl cellulose, vinylidene chloride copolymer, cellulose acetate, cellulose acetate butyrate, cellulose propionate, phenolic, urea, and melamine. In general, they showed no tendency to collect dust in definite, well marked patterns. In most cases the thin, uniform layer of collected dust was almost invisible in white light examination. Only under black light did the existence of the unpatterned layer become definitely visible.

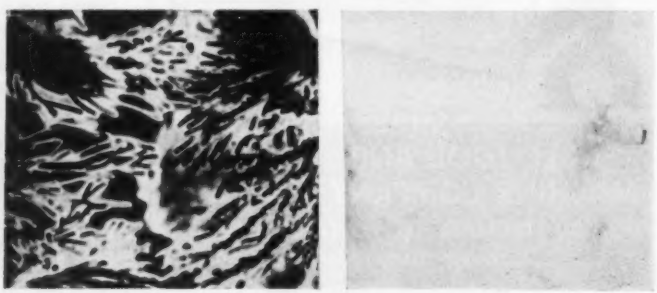
The foregoing observations do not necessarily mean that *all* polystyrenes will *always* show more objectionable dust deposits in normal use than will *any* other plastic, nor do they mean that other plastics may not be capable of holding an artificial charge of some magnitude. Reference is made only to the *natural deposits* of dust on untouched moldings, not to *visibility* of the dust on plastic products treated in an unknown manner. Such things as humidity, color of dust, color of plastic, and other variables are bound to have an important effect.

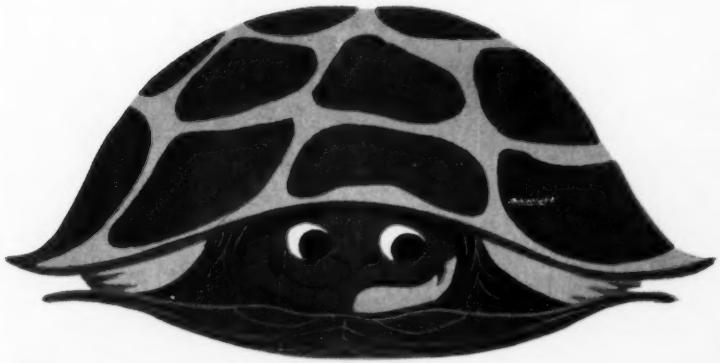
Surface Resistivity of Plastics

We have already shown that polystyrene's dust collecting diffi-

(*Continued on p. 177*)

Fig. 7—Effect of moisture in dust. Left: Polystyrene tile treated at 20% RH with dry dust. At right: the tile has been treated at 20% RH with dust held at 95% RH for 4 days





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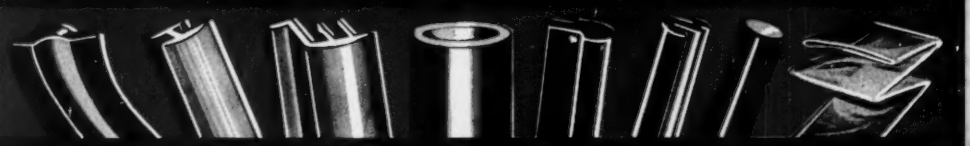

culties can be attributed solely to the static charge on its surface. The greatest charge imparted at any one time undoubtedly occurs as the molding is ejected from the mold during the fabrication process. Subsequent machining, handling, packaging, wrapping, unwrapping, and dusting in actual use may serve to alter or augment the original charge. Dust floating in the air and impinging on the molding undoubtedly serves to do the same thing though at a slower rate. It is safe to say that many different factors during fabrication and use tend to build up this static charge on polystyrene.

The same factors are available to create this static charge on other plastic materials. The reason that they do not build up a similar charge (and therefore collect dust in the same manner) is that their ability to leak the charge off varies with each material. Thus it is that certain plastics with lower surface resistivity allow these high charges to leak off at a somewhat more rapid rate than polystyrene, and hence collect less dust. Those with much lower surface resistivity allow a much more rapid leaking off and do not collect dust in unusual amounts or patterns.

By way of illustration let us assume a plastic sphere 6 in. in diameter being "grounded" by a flat sheet of the same material. It would have a capacity of about 10^{-11} farads. If we then say arbitrarily that a static charge should be dissipated in 1000 sec., we can calculate the resistivity required for the charge to be reduced to $\frac{1}{e}$ of its original value within that time.

$$\text{Resistivity} = \frac{\text{Time Constant}}{\text{Capacity}}$$

$$= \frac{10^3}{10^{-11}}$$

$$= 10^{14} \text{ ohms}$$

In other words, a surface resistivity of approximately 10^{14} ohms would be required to dissipate a charge on the plastic surface in a period of 1000 seconds.

The use of polystyrene as an electrical insulator in the manufacture of radioactive detection devices fixes its surface resistivity at about 10^{19} or 10^{20} ohms. Now if we use this figure in the foregoing formula and recalculate it for the time constant, we get an answer of 10^8 sec., or about 3 years necessary for a charge on polystyrene to leak off under ideal conditions. Naturally other factors operating during that time will tend to build the charge up, which in effect means that pure polystyrene cannot leak a charge off.

It is obvious from this that polystyrene cannot at the same time be an excellent electrical insulator and still not collect dust. The factors which make it such an outstanding insulator also make it hold a charge. Dust attraction is the natural result. If a truly static-free (and hence dust-free) polystyrene is to be made, it would have to be at the expense of its present electrical properties. This would be a development of primary importance, however, because most polystyrene is sold for use in other than electrical applications anyway.

It is interesting to note at this point that our test results on several plastics, obtained by the use of an accelerated dusting technique, correlate completely with values of surface resistivity recently published by Von Hippel. Table I lists these values in descending order of

surface resistivity, and therefore gives a more accurate picture of dust collecting ability than the previous listing. Limitations in testing equipment prevent the measurement of surface resistivity above 10^{16} ohms. Therefore it was necessary to arrange the plastics having higher values according to data and background information from previous field performances. As might be expected, some of the plastics are appreciably more affected than others by moisture content of the surrounding air; humid weather would have a more noticeable effect on these plastics as far as dust pickup is concerned.

Destaticizers

Obviously the ultimate goal of such an investigation as this is the development of a static-free formulation of polystyrene. We have shown, however, that the excellent insulating characteristics of this material are such as to make it hold a static charge, and hence collect dust. We have also shown that of a variety of special ingredients or treatments, some are without any merit, some are effective for a limited time only, and some are both dangerous and expensive. There seems to be little likelihood of a static-free formulation of polystyrene in the near future.

The next best answer appears to be the application of a good destaticizer subsequent to the molding operation. Because of the additional equipment required and the added handling time and expense involved, this operation may not be economically feasible for some small jobs. However, a very large number of plastic moldings made at the present time are being destaticized, and because of the over-all success of these operations the trend is toward more widespread use of such treatments in the future.

Some of the techniques developed during this investigation have proved invaluable in the testing of destaticizers. Many available destaticizers have been evaluated to date by a fast and accurate method involving the use of an electrostatic voltmeter and blown synthetic dust. In addition, experimental products of six companies have been evaluated, in an effort to help them market high quality destaticizers. Table II summarizes much of the information on the better products available at the present time. It should be realized that the table is not necessarily complete, that it is based primarily on tests of an arbitrary nature, and that the prices listed were those in effect at the time of writing.

It will be noted that, despite published claims of "water insolubility," no destaticizer tested so far will withstand the washing test. As far as is known at present most (if not all) destaticizers are effective only because they are hygroscopic, that is, they attract some moisture from the air and create on the surface of the plastic molding a thin conducting layer. Whether the destaticizers are insoluble or not makes little difference; dirt is not usually soluble but it can be effectively flushed from one's hands by means of soap and water. The marked affinity of these products for water, plus the fact that they are held on the plastic surface only by their own viscous nature or at best by a weak chemical bond, adds up to the fact that destaticizers are easily flushed off by water.—END

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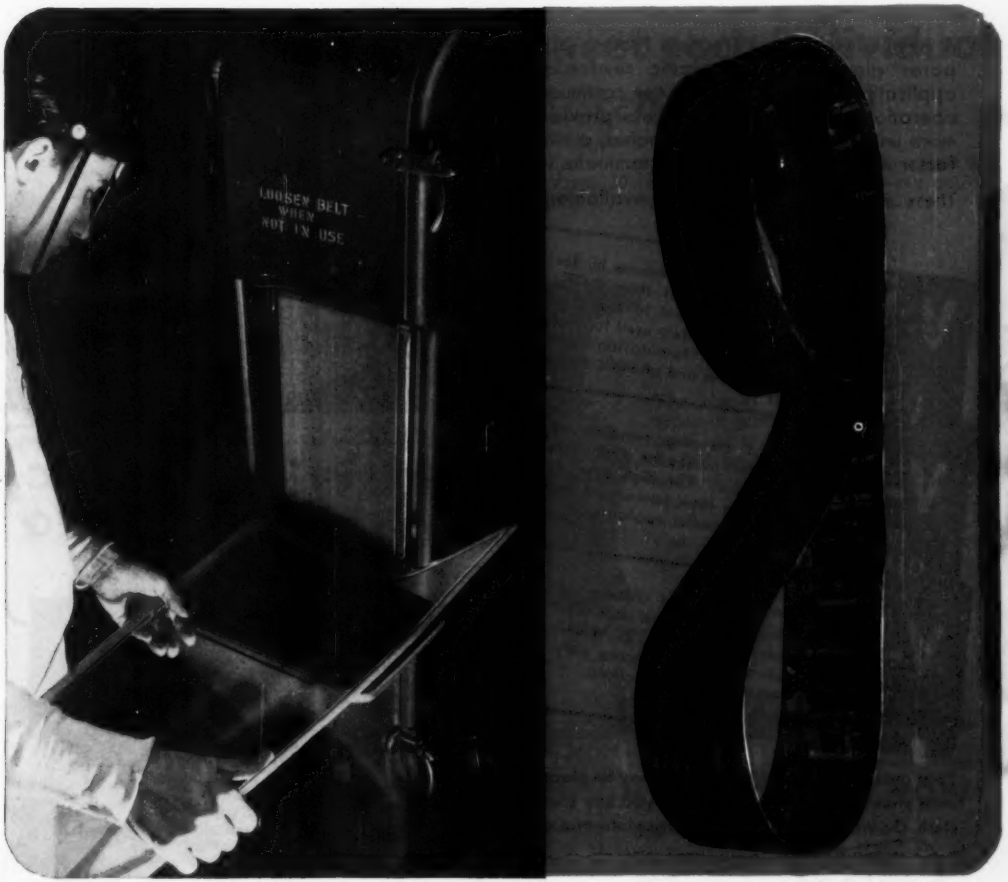

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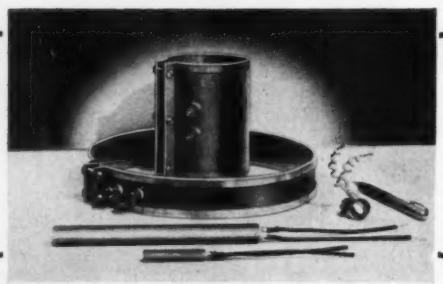

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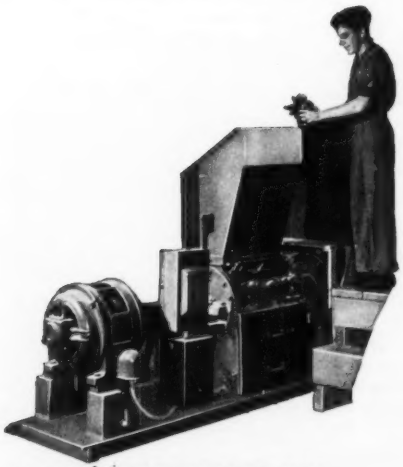

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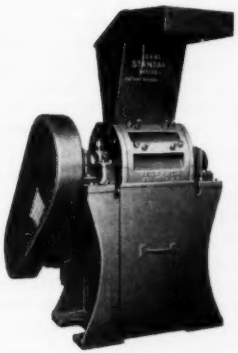

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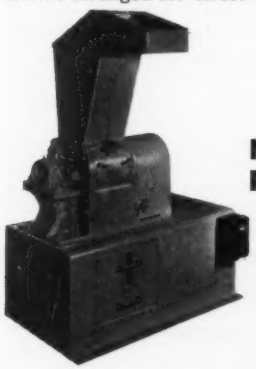

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Cellulose Acetate in England

COMPLETION of negotiations with James Nelson Ltd., Lancashire, England, and Erinoid Ltd., Stroud, Gloucestershire, England, for the production of cellulose flake has been announced by Hercules Powder Co., Ltd., a wholly-owned subsidiary of Hercules Powder Co. Part of the cellulose acetate will be used by Nelsons Silk, Ltd., in the production of cellulose acetate rayon; Erinoid will use cellulose for the production of cellulose acetate plastics. The remainder will be distributed by Hercules to industrial consumers in Great Britain and elsewhere abroad.

Ethyl-Benzene Plant in Texas

HIGHLIGHTS of a multi-million dollar expansion program in the Chemical Div. of Koppers Co., Inc., provide for construction of a new plant near Port Arthur, Texas, and additions to present facilities at Kobuta, Pa. The expanded facilities are expected to increase the Chemical Div.'s production of styrene monomer by approximately 33% and of polystyrene by 25% within a year. The Texas plant, to be built on a 1000-acre tract, will produce ethyl-benzene, which will be transported to Kobuta for the manufacture of styrene and polystyrene.

Research Laboratory

CONSTRUCTION of a quarter-million dollar research and development laboratory to be located at Leroy, N.Y., has been announced by Durez Plastics & Chemicals, Inc. Dr. Alvin F. Shepard of the present research staff will be director.

Increased Styrene Production

NEGOTIATIONS are underway for the purchase of a 115-acre site in Addyston, Ohio, near Cincinnati, on which a new plant will be constructed to operate as a part of the Monsanto Chemical Co.'s Plastics Div. under the direction of F. A. Abbiati, division general manager. The Ohio plant is one of the units in Monsanto's $22 million plastics expansion program.

Initial operations call for production of styrene molding material and phenolic resins. Production is expected to begin early in 1952.

Monsanto has also announced that the company may soon spend $20 million to increase output of chlorine and phthalic anhydride. In addition, negotiations with E. I. du Pont de Nemours & Co., Inc., for the licensing of Chemstrand Corp. to produce nylon are nearing completion.

Plans to increase the capacity of the Long Beach, Calif., plant for styrene molding compound are being perfected by Monsanto. The projected expansion is expected to permit a 100% increase in production capacity, although a material shortage might not permit a full doubling of production at the outset, according to Irving C. Smith, general manager of the Western Division. The installation of new equipment should be completed in July.

New Fiber Glass Plant

FORMATION of a new division has been announced by Libbey-Owens-Ford Glass Co. to manufacture fiber glass in the company's Parkersburg, W. Va., plant. This marks the firm's first entry into a wholly new field since it established its Plaskon Div. in 1943.

A certificate of necessity has been issued by the government for development of the new business to aid in the national defense rearmament program.

Equipment of the Parkersburg plant, which has more than 200,000 sq. ft. of floor space, will be rushed so that production may be under way in approximately six months. A license agreement has been negotiated with Owens-Corning Fiberglas Corp. to use its patents and processes for making textile and superfine fiber glass, supplemented by an engineering agreement covering technical and engineering assistance.

The new fiber glass division will be under the general direction of G. P. MacNichol, Jr., vice president of Libbey-Owens-Ford. Robert E. Worden has been named general manager, Donald L. McClure factory manager, and Robert M. Whittington office manager. Clinton F. Hegg is sales manager of the company's new fiber glass division.

Plant Rebuilt

THE resorcinol plant of Heyden Chemical Corp. at Garfield, N J., which was partially destroyed by an explosion of unknown cause, will be immediately rebuilt. Reconstruction will be expedited, according to N.P.A. authorities, "due to the importance of resorcinol in the defense program."

Production schedules on other products manufactured by Heyden are not affected in any way by the temporary loss of the resorcinol plant, according to J. P. Remensnyder, president of Heyden.

Unplasticized Polyvinyl Resin

MANY applications in the fields of structural plastics and wire and cable insulation for polyvinyl materials are predicted for a new, high molecular weight polyvinyl resin that can be processed without plasticizer. Called Geon 404, the resin is being offered by B. F. Goodrich Chemical Co. in limited quantities and only for the development of military and other essential applications during the emergency.

Outstanding electrical, physical, and chemical properties of pure unmodified polyvinyl chloride characterize the new resin, which can be processed (extruded, calendered, or molded) successfully into rigid vinyls on conventional plastics equipment.

Corrosion Prevention

VINYL coatings for the control of corrosion on various surfaces have been announced by Casey & Case Coating Co., P. O. Box 151, Maywood, Calif.

The producer claims that its coatings will withstand severe weathering conditions and combat the corrosive action of acids, acid fumes, alkalies, salts, and other corrosive agents. The coatings are applicable

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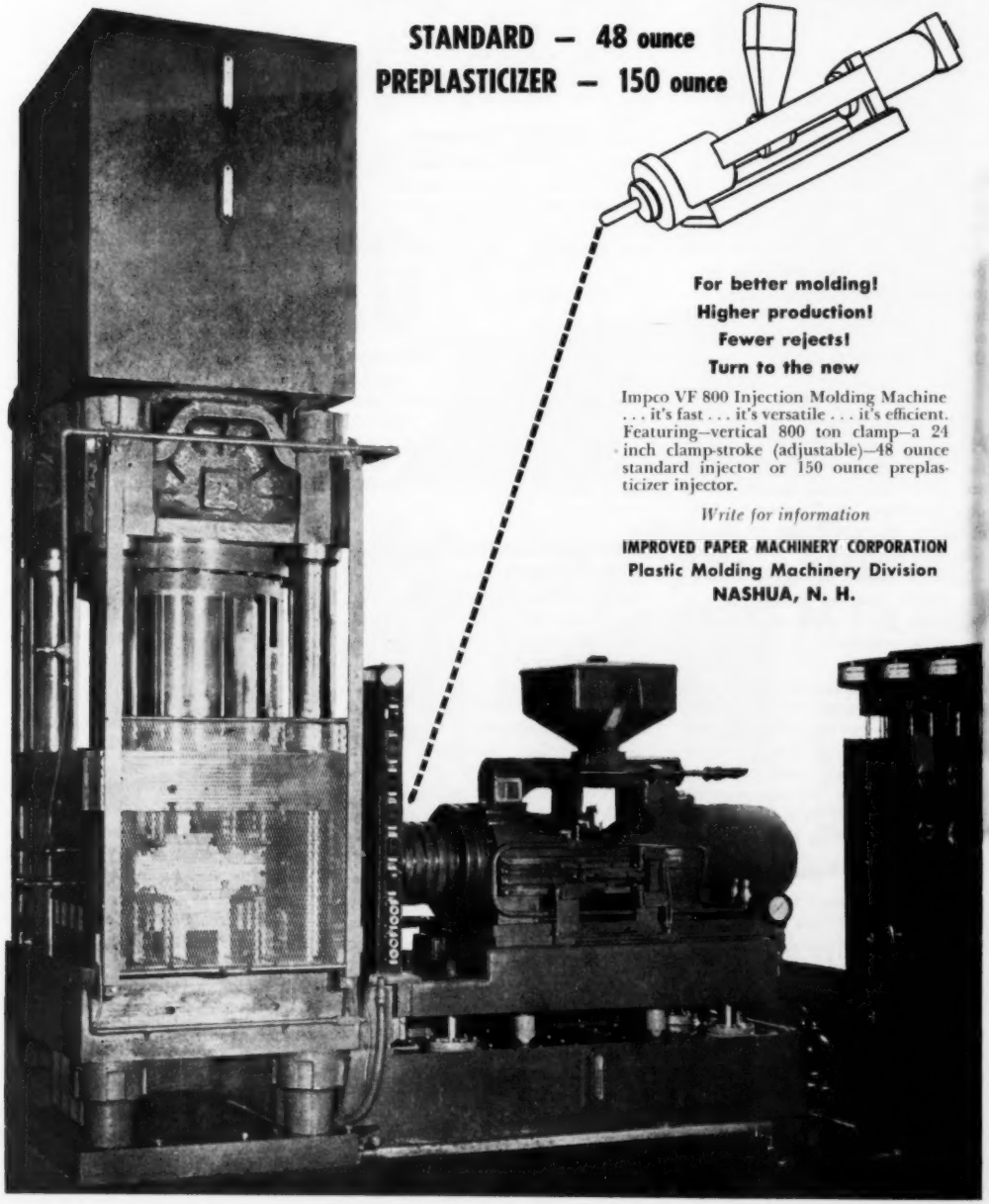

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to metals; concrete, stone, brick, stucco, plaster, pumice, or other formed blocks; Celotex; wallboard; and plywood. Brushed on, sprayed, or dipped, excessive solvents quickly evaporate, leaving a tough, ductile, non-inflammable, non-combustible and strongly adhesive finish.

The most outstanding use is claimed to be control of corrosion on structural steel, but it is also interesting to note that these coatings will not absorb or transfer odors, are non-toxic, tasteless, and odorless, and therefore are claimed to be effective for the protection of food products. Thus, they are being promoted for surface coatings in the interior of equipment used by dairies, creameries, ice cream plants, bottling works, and so forth.

Slat Expanders

AMONG the newest types of slat expander—which is used in nearly all phases of the vinyl film and sheet fabricating industries—is one developed by Progressive Machine Co., Inc., 198 E. 25th St., Paterson, N.J.

Slat expanders have been used in the textile industry for 80 years to help keep wrinkles out of goods that are being processed. In the vinyl industry they are used by spread coaters and by calenderers just before final wind-up of the goods. Printers use two sets of expanders; one just before the film goes into the printing rolls, and one just ahead of wind-up. The new advance made by the firm in the expander includes ball bearing housings.

Vinyl Latex for Paper and Paint

EXTENSIVE research on vinyl and vinylidene chlorides by The Dow Chemical Co., Midland, Mich., has resulted in the development of a new vinyl latex, Dow Latex 744-B, for use in the paper, textile, and paint industries.

Now in commercial production, the new latex is designed to serve both as a functional coating material and as a pigment binder. It gives resistance to moisture, chemicals, and grease in functional paper coatings, and will produce durable fire- and chemical-resistant paints, fabrics, and coated wallboard, according to the company.

Dow Latex 744-B is weather resistant, a desirable property for tent, awning, and tarpaulin coatings, and is finding widespread use for military applications in the textile, paint, and paper fields.

Anti-Static Compounds

TWO anti-static compounds, said to have been under development for six years, are now being marketed by Merix Chemical Co., 1021 E. 55th St., Chicago 15, Ill. No. 79 is principally used on smooth surfaces where it is wiped, sprayed, or brushed on; No. 79-OL is used on textiles and plastic fabrics, often compounded at various manufacturing stages, but sometimes wiped onto finished products, such as automobile seat covers. Both compounds, while of different chemical chains, are claimed to be non-flammable, fairly fast drying, and practically invisible when dry.

Non-Toxic Calendered Vinyl Film

UNSUPPORTED, non-toxic, 2-mil or under calendered vinyl films in a variety of widths are now available from Ross & Roberts Sales Co., Inc., 350 Fifth Ave., New York, N.Y. Ross & Roberts, Inc., Stratford, Conn., manufactures the films in formulations approved as non-toxic for use in food packaging. Availability of the films is of particular interest to the food packaging and protective materials fields for both military and civilian applications because of the growing shortages of other materials. It is believed that this is the first time that such films have been produced by calendering.

More About Ion Exchange

AMONG the more recent uses for the growing field of ion exchange resins is the recovery of chemicals and the elimination of stream pollution by a large paper mill in British Columbia.

Another unusual experiment was made on 19 dairy cows who drank hard water exclusively for three weeks, then soft water which had been treated with ion exchangers for three weeks. Milk production for the ast period increased 22.4% without reduction in butter fat content—an average monthly sales value boost of about $170.

A manufacturer of water softener equipment estimates that the total sales of domestic water softeners for the next 20 years could easily reach $30 million a year, since 85% of American homes are in hard water areas. Each softener would generally require ion exchange resins.

The experimentation with ion exchange resins to eliminate salt-free diets for people suffering from dropsy continues to show promise.

Vinyl Sealing Tapes

SEALING tape utilizing Geon polyvinyl resin, a product of B. F. Goodrich Chemical Co., has been introduced in two types by Technical Tape Corp., New York, N.Y.

The first is a water- and moisture-proof tape designed for sealing packages for overseas shipment. The tape, which meets Government specifications JANP 127 and ANT 12-A, is used primarily for applications that require a stronger and more resistant material than paper as in sealing cans and reinforcing and sealing cartons. Break-Pruf tape, the second development, replaces metal strapping and is used for heavy duty operations such as wrapping coils of wire and metal strips and banding plate glass, rods, tubing, etc. Consisting of a paper backing reinforced with longitudinal glass fibers, the tape is said to have excellent tear resistance, tensile strength, and adherence ability.

Vinyl Film for Soldiers

SUGGESTIONS have been made that every soldier could use a square or sheet of vinyl film in his pack for various and sundry uses. In support of this contention, Donald S. Farrington of Chavannes Industrial Synthetic, Inc., presents a letter from his kinsman, Michael G. Farrington, a veteran of the Philippine campaign in World War II and a reserve officer, who tried out a piece of vinyl film 54 in. by 90 in. at maneuvers during an especially wet period last fall.

Mike Farrington points out the following uses which he made of this piece of film: 1) Small pieces were cut out and used by five other men

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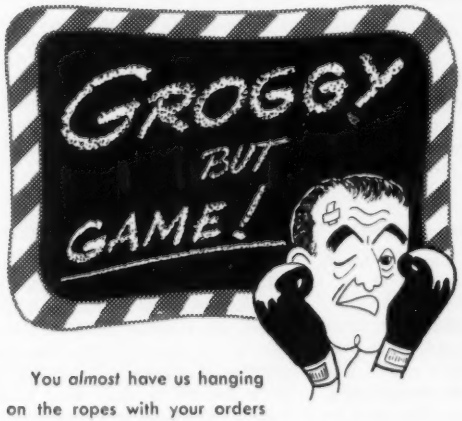

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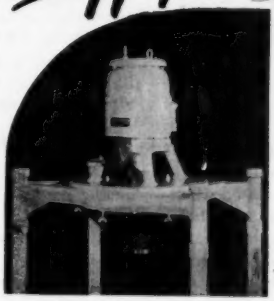

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The "ENTOLETER" Mixer provides the simplest, most economical method of producing a homogeneous mix. It is easy to install and operate. Requires only 12 cubic feet of space; yet can produce a finished mix at rates up to 200 lbs. a minute. It is adaptable to either batch or continuous mixing. Entoleter Division, The Safety Car Heating & Lighting Co., Inc., 1195 Dixwell Ave., New Haven 4, Conn.

Send for bulletin and reprint describing results on plastics applications.

ENTOLETER

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for wrapping pistols to protect them against rain; 2) Used to wrap 57 mm. recoilless rifle in place of GI duck cover. Company commander commented that the vinyl wrapped rifle was the only dry piece in the battalion; 3) Vinyl film over pup tent helped keep occupant dry during night and day of heavy rain; 4) As cover for blanket roll in rain, it proved more efficient than shelter-half; 5) Used as a mat when stripping rifles and machine guns to keep parts dry and free from dirt.

Decalcomanias

DECALCOMANIAS which, when applied to acetate, will not become soft and tacky within a short time have been announced by Midwest Decalcomania Co., 525 W. 76th St., Chicago 20, Ill. This decal type is permanent; under tests conducted at 100° F. and 90% relative humidity it discloses no softening, tack, or other decomposing action. The application of this decal is conducted in the conventional water-release method — that is, it may be simply dipped in water and transferred to the desired position.

Another decal for styrene has also been announced. It is claimed that this decalcomania has overcome the bonding problems usual inherent in decals for styrene.

Styrene-Butadiene Paint

ANOTHER entrant in the field for production of styrene-butadiene rubberlike paint was disclosed when Pittsburgh Plate Glass Co. announced the introduction of a material based on the same rubber chemicals which have recently taken the paint industry by storm. The paint is recommended exclusively for interiors, but not particularly for bathrooms or kitchens because it might streak from the effects of steam until it has had sufficient time to cure. The paint dries in 15 min., but curing time is about three weeks.

The product, called Wallhide Rubberized Satin Finish, is similar to the other styrene-based paints already on the market in that it can be easily applied without addition of a thinner and can be scrubbed or washed after full cure. An additional property claimed for this particular brand of styrene-butadiene paint is that it will not freeze in storage even though the vehicle which carries it is water.

When asked what they expect to do about a supply of styrene to insure production, company spokesmen asserted that they were fairly well assured of sufficient supplies for at least six months, and that the time might come when they would not be entirely dependent on styrene anyway. Furthermore, spokesmen feel that styrene for this paint might be allocated for the consumer market so that oil paint can be diverted to the defense program.

Coating Cuts Glare

DULLING the reflecting surfaces of stainless steel in guided missiles, aircraft instruments, and other apparatus for military use can now be achieved by a new cellulose ether base finish, VB 248, developed by United Lacquer Mfg. Corp., 1001 W. Elizabeth Ave., Linden, N.J. The coating was developed originally in black in a dull finish, but because of its good adhesion to highly polished surfaces, the company expects to find other applications where elimination of glare is not the primary objective. In such cases, the material may be prepared in all colors, in a semi-gloss or gloss finish.

New Glues for Woodworking

INTRODUCTION of a new wood adhesive and abrasive binder designated as 530-11L has been announced by the Plaskon Div., Libbey-Owens-Ford Glass Co. The glue is a modified urea resin sold in liquid form and reported to cure very rapidly by exotherm when used in continuous lumber core bonding operations. In addition, the new resin may be used satisfactorily in cold press assembly gluing.

It is light tan to brown syrup in color and can be kept stable for three months at 80° F. It can be mixed in standard mixing equipment. At 90° F., a normal mix will have a working life of 1½ hr.—at 75° F., working life is about doubled.

Another new glue recently announced by Plaskon is a phenolic resin for hot press plywood gluing that produces glue lines passing Army-Navy Aeronautical Specification AN-A-45. The new glue has been developed to allow users of Plaskon glue in the woodworking field to undertake government mobilization work with a glue meeting the military requirements. Designated Plaskon 815-12, the resin is sold as a fine powdered material, red to brownish red in color.

The phenolic resin may be extended up to 20% with walnut shell flour where cheaper mixes are desired. Caustic soda added to a mix of resin, water, and flour allows shorter assembly times than normal.

FINANCIAL

Pantasote Co. reports net profit of $176,514 on net sales of $5,467,903 for 1950, compared with a 1949 profit of $34,919 on sales of $4,167,665.

United States Plywood Corp. reports net profits for the nine months ending Jan. 31, 1951, exclusive of unconsolidated equities, of $6,726,900, against $2,654,400 in the corresponding period of the previous fiscal year. Consolidated sales for the same period were $78,564,000, compared with $49,412,000 in the same three quarters of 1949.

Celanese Corp. of America reports a net income in 1950 of $40,361,166, a new record which compares to $20,640,826 in 1949. Sales during 1950 were $232,483,942 compared with $171,292,005 in 1949. The company has spent $150 million for plant expansion since the war, $6,056,064 having been spent in 1950.

E. I. du Pont de Nemours & Co., Inc., earned a net income of $307,601,913 on sales of $1,309,528,190 in 1950 which was up 27% from the previous year's sales of $1,031,979,405 when the net earnings were $213,672,141. During the last five years the company has spent nearly $550 million on plant expansion, of which $114 million was spent in 1950.

COMPANY NOTES

Merit Molded Plastics Corp., formerly Merit Plastics Co., 25 Hewes St., Providence, R. I., has announced that **Irving Newman** has been named president and treasurer, in charge of manufacturing, and **Joseph Block**

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vice president, in charge of sales and purchases.

Hartford-Empire Co., Hartford, Conn., of which Plax Corp., also of Hartford, is a wholly owned subsidiary, has changed its name to **Emhart Mfg. Co.**, effective immediately.

Julius V. Einhorn Associates, 45 W. 33rd St., New York, N. Y., has been appointed sole United States agent for Warerite, Ltd., London, England, manufacturer of industrial plastic laminates for use in electronics, insulation, gears, and postforming.

Hercules Powder Co. announces that its San Francisco office has moved to the Standard Oil Bldg., 225 Bush St.

Gnaedinger & Van Zelst Labquip Corp. has been appointed exclusive agent for the sale of equipment manufactured by **Tinius Olsen Testing Machine Co.**, Willow Grove, Pa.

The Dow Chemical Co. announces that **William R. Dixon** has been named assistant general sales manager. Mr. Dixon has been with the firm since 1936. **Deane Ebey** succeeds him as assistant manager of the plastics sales division. The company has also appointed **Harmon W. Nickless** assistant to **Corliss F. Cummins**, head of the molding powders section of the plastics sales division.

The Rex Corp. has acquired all production, sales, and development responsibilities for Product Development Co.'s Prodelin Nonstrip wire which will in the future be designated Nonstrip. **Peter R. McClure** has been appointed technical sales engineer for the product.

The Carpenter Steel Co., Reading, Pa., has appointed **Norman W. Calkins** manager of tool steel sales and **Harold A. Brossman** manager of alloy steel sales.

Emery Industries, Inc., has discontinued the services of its Chicago representative, Clarence Morgan, Inc., and has opened a direct sales office at 221 N. LaSalle St. under **E. G. Hibarger.**

R. S. Aries & Associates, New York, N. Y., consulting chemical engineer, has acquired the business of William Y. Agnew, a consulting chemical engineer who specializes in pigments and engineering design.

Rohm & Haas Co. announces that **Frederick W. Tetzlaff**, assistant sales manager of the **Plastics Dept.**, has been assigned to the production department as assistant to **Dr. Lloyd W. Covert**, vice president. **William T. Reedy** was named to head the **Plastics Dept.'s** sales development staff; and **William H. Gibson** has been assigned to technical sales work with the **Resinous Products Div.** in the Cleveland area.

Sylvania Div., American Viscose Corp., has transferred its **Market Development Dept.** from 350 Fifth Ave., New York, N. Y., to 1617 Pennsylvania Blvd., Philadelphia, and its **Technical Service Dept.** from Fredricksburg, Va., to the Philadelphia office.

Lincoln Plastics Corp., Cambridge and Circleville, Ohio, has announced its entry into the low pressure laminating and sheet forming plastics field. New facilities for these processes have been added to the Cambridge plant. The firm still molds plastic wall tile, refrigerator components, housewares, and plastic building blocks.

Major Plastic Products has recently been established by **Alfred Maruli** at 30 Mott St., Oceanside, N. Y., for injection molding and fabricating plastics.

The Borden Co., Chemical Div., has announced the appointment of **Barton B. Wadsworth** and **Dr. Edward L. Kropa** as divisional vice presidents. **Eugene J. Sullivan** was named sales manager for the company's line of industrial adhesives.

Blaw-Knox Co., Chemical Plants Div., has received a contract from the **Catalin Corp. of America** to construct additional storage facilities for the latter's liquid resin plant at Calumet City, Ill.

Manufacturing Chemists' Association has appointed a **Resin Adhesives Technical Subcommittee** to work with the armed services. Members of this committee are **R. P. Hopkins, Rohm & Haas Co.; Leonard Repsher, Bakelite Co.; John F. Corwin, Koppers Co., Inc.**

Plaskon Div., Libbey-Owens-Ford Glass Co., has announced that **Dr. Harold Hoppens** has been promoted to associate director of research, and **John A. Morse** has joined the division as manager of operations.

General Electric Co. announces the following personnel changes in its **Chemical Department: Earl F. Arnett** is in charge of the **Pittsfield Chemical Process Development Section; Robert L. Teeter** has been named manufacturing engineer, and **Alfred R. LaCasse** manufacturing analyst for the **Chemicals Div.** of that department.

B. F. Goodrich Chemical Co. has appointed **Robert D. Scott, Jr.**, general manager of production for all plants. **John L. Nelson** succeeds him as plant manager at Louisville, Ky. The company also announces the move of its Chicago sales office to Suite 1124, Board of Trade Bldg., W. Jackson Blvd., Chicago 4, Ill.

Owens-Corning Fiberglas Corp., has appointed **George S. McElroy** as project manager of the new Fiberglas yarn plant in Anderson, S. C. He joined the company in 1946. **Benjamin Hammer** has been named manager of the New York Fiberglas Building at 16 E. 56th St.

Plax Corp., Hartford, Conn., has reactivated its specialized fabricating services on thermoplastic materials as an aid to manufacturers with military contracts involving styrene.

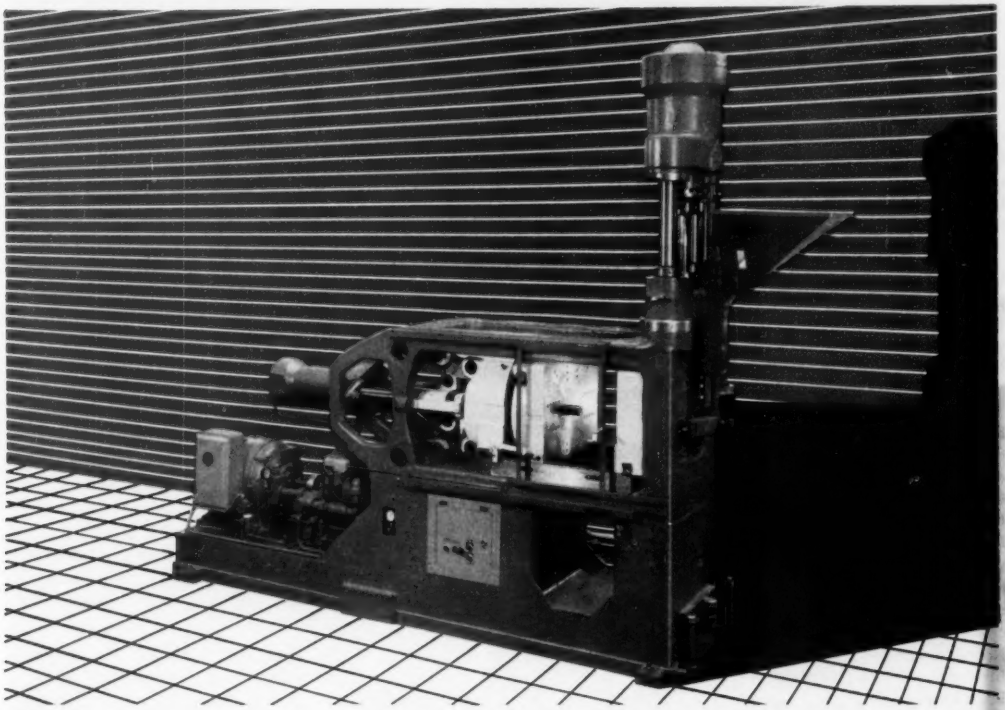
Corrulux Corp., manufacturer of shatterproof translucent plastic panels, has announced an expansion plan for its Houston, Texas, plant which will increase annual capacity from 4 to 6 million square feet.

Pioneer Plastics Corp., Salem, Mass., producer of Pionite high pressure decorative laminates, has expanded its facilities to produce a full line of industrial laminates.

Textileather Corp., Toledo, Ohio, has created a **War Production Committee** to develop and service contemplated and current war output.

E. I. du Pont de Nemours & Co., Inc., has announced that **Dacron** is the new trade-mark for its polyester

THE NEW 8 OUNCE LESTER



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fiber, originally called Fiber V and later Amilar.

The Dow Chemical Co. will operate a new United States Atomic Energy production plant in the area of Boulder and Jefferson Counties, Colo. **F. H. Langell** of Dow will manage the plant.

The Formica Co. has announced that **L. J. Francisco**, formerly district manager of the New York City office, has become vice president in charge of sales and advertising with headquarters at the home office, 4614 Spring Grove Ave., Cincinnati, Ohio. The manager of the Philadelphia office, **A. J. Lesbirel**, has taken over as district manager in the New York office. **Howard Henderson** of the Grand Rapids Formica office has been appointed district manager of Decorative Materials in Rochester where **Edward Wolcott** is district manager in charge of industrial laminates. **Fenton Hamilton**, formerly in charge of Decorative Materials in Rochester, is succeeding **A. J. Lesbirel** as district manager in the Philadelphia office.

Claude P. Bamberger, Inc., has announced the consolidation of its office and warehouse at 226-228 Wooster St., New York, N. Y.

PERSONAL

Walter H. Roesing has been named district sales manager in certain areas of New York, New Jersey, and Connecticut for **DeWalt, Inc.**, manufacturer of cutting machines for the wood, metal, and plastics fields.

Howard G. Smith has returned to **Resin Industries**, Santa Barbara, Calif., as vice president. Mr. Smith first joined the firm in 1946 and left in 1948 to work with American Radiator & Standard Sanitary Corp.

A. B. Cluman, Pliofilm Sales Dept., The Goodyear Tire & Rubber Co., has been granted a leave of absence to accept a post with the National Production Authority where he is in charge of films and plastics in the Packaging and Container Section.

Jean O. Reinecke, Reinecke & Assoc., was elected chairman of the Chicago section of the Society of Industrial Designers.

O. E. Isenburg, field sales manager of **B. F. Goodrich Chemical Co.**, is attending the 19th session of the Advanced Management Program at the Harvard Graduate School of Business Administration.

Thomas G. Wyman has joined **Omni Products Corp.**, 460 Fourth Ave., New York 16, N. Y., as vice president and will develop an import program of general finished specialty products. Mr. Wyman was formerly associated with Liebermann-Waelchli Co., Inc.

Wade H. Coffing has been named sales manager of **P. R. Mallory Plastics, Inc.**, Chicago, Ill.

Charles A. Cox, formerly with Wilton Tool Co., has been appointed sales manager of **Rogers Plastic Corp.**, West Warren, Mass. **Francis X. O'Toole** has joined the firm as assistant sales manager in charge of sales promotion.

George M. Schau has been named to the newly created post of director of purchases of **Erie Resistor Corp.**, Erie, Pa.

Islyn Thomas has been named general manager of **Newark Die Co.**, 24 Scott St., Newark, N. J. Mr. Thomas will also continue in his present capacity as president of **Thomas Mfg. Co.**, 80 Clinton St., Newark, N. J.

Dr. Bryant E. Harrell has recently joined the **Market Development Div.** of **Jefferson Chemical Co., Inc.**, 711 Fifth Ave., New York 22, N. Y.

C. S. Immig has been appointed director of purchases for **The Hydraulic Press Mfg. Co.**, Mount Gilead, Ohio.

Wayne F. Anderson of **B. F. Goodrich Chemical Co.**, was elected president of the Cleveland-Akron Section of The Society of Plastics Engineers for 1951.

Bradley Dewey, Jr., was elected vice president of **Dewey & Almy Chemical Co.** in charge of the **Cryovac Division**. Dr. Dewey, who organized the firm's product development branch, has been with the firm since 1945.

Deceased

Hilbert Wachtel, owner of **Industrial Plastics Co., Inc.**, 90 Commerce St., New Haven, Conn., died recently. He was associated with **Plastic-Ware, Inc.**, as one of the principals for more than 10 years.

William G. Krummrich, vice president of **Monsanto Chemical Co.** and general manager of the **Organic Chemicals Div.**, died recently at the age of 56. Mr. Krummrich joined the company in 1917, and has been a vice president since 1949.

J. Roger White, vice president of **Formica Co.**, 4600 Spring Grove Ave., Cincinnati, Ohio, died Mar. 18.

Clarence E. Ahlborn, vice president of **Jackson & Church Co.**, died recently in Saginaw, Mich.

MEETINGS

May 7-13—Forest Products Research Society, 5th Annual National Meeting and International Industry Show, Convention Hall, Philadelphia, Pa.

May 16-18—Society for Experimental Stress Analysis, Spring Meeting, The National Bureau of Standards and The Wardman Park Hotel, Washington, D. C.

May 17—Worcester-Leominster Chapter Meeting, The Society of the Plastics Industry, Sterling Inn, Sterling, Mass.

May 24-25—The Society of the Plastics Industry, Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

May 28-June 8—Canadian International Trade Fair, Exhibition Grounds, Toronto, Canada.

June 18-20—Pacific Coast Chapter Meeting, The Society of the Plastics Industry, Tahoe Tavern, Lake Tahoe, Calif.

June 18-22—American Society for Testing Materials, Annual Meeting, Atlantic City, N. J.

S.P.E. Meetings

May 16—New York Section of S.P.E. at Hotel Shelburne, New York, N.Y. E. O. Clark, Vickers, Inc., will speak.

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Name parts of tenite Bright plated

Handle of polyethylene

Case of polystyrene

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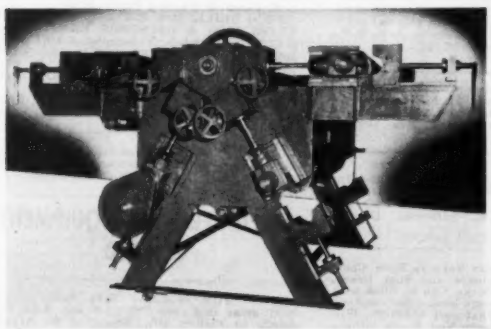

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FOR SALE: 1—Royle #1 Perfected Extruder with Oil Heating Unit and 5 HP Motor. 1—HPM Vertical Injection Molding Machine, 8 oz. cap. Reply Box 929, Modern Plastics.

We handle hydraulic presses, pumps, and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. Hydraulic Sal-Press, Inc., 386-90 Warren Street, Brooklyn 2, N.Y. MAin 4-7847

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(*Continued on p. 196*)

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CLASSIFIED ADVERTISING

(Continued from p. 194)

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WANTED: PLASTIC Scrap or Rejects in any form. Acetate Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 924, Modern Plastics.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic and Ethyl Cellulose. Reply Box 925, Modern Plastics.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 5-7943.

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WANTED: Surplus Virgin Polystyrene for export. Will consider any color or amount offered. Will pay top prices. Also will buy your surplus molds for small injection molding machines for export. Reply Box 945, Modern Plastics.

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SITUATION WANTED: Married man age 39, with 21 years in injection plunger and compression molding, desires position with small plastic molder as supt. or plant manager. I have practical, on-the-job education in all phases of plastics manufacturing and am presently serving as supt. in plant in Chicago area. Location unimportant. References gladly furnished. Available 2 weeks. Reply Box 928, Modern Plastics.

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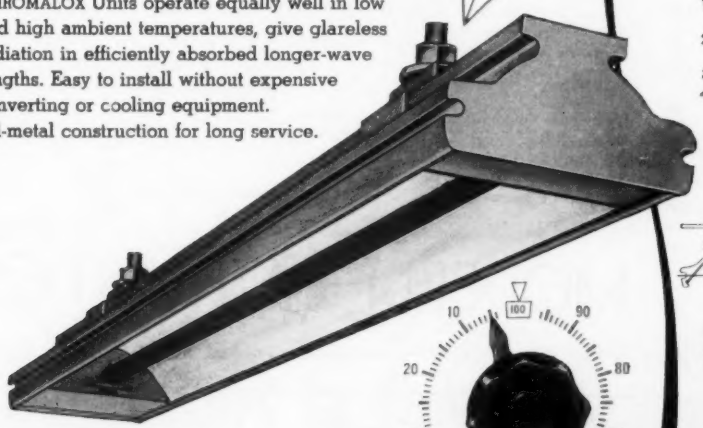
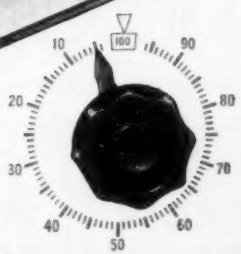
Uniform, EXACT infrared heat

at the turn of a dial

You can "dial" the exact uniform heat you need to fit the job in infrared drying, baking, preheating, curing, dehydrating and similar applications when you use CHROMALOX Electric Radiant Heaters. Compact CHROMALOX Units operate equally well in low and high ambient temperatures, give glareless radiation in efficiently absorbed longer-wave lengths. Easy to install without expensive converting or cooling equipment. All-metal construction for long service.





CHROMALOX Radiant Heaters

trouble-free — All-metal unit withstands shock, vibration, dust, blows and rough handling. Not affected by splashed liquids; nothing to shatter.

flexible heat — Precise temperatures at the turn of a dial, easily regulated for changed working requirements. Ovens can be zoned for stepped-down heat.

color-blind — Chromalox Radiant Heat ignores color variations; longer-wave length infrared is absorbed equally by all colors, textures, surfaces.

uniform heating — Light, dark or multicolored work may be processed simultaneously. Proper heater positioning assures an even blanket of heat without hot-spots.

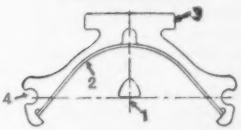
CHROMALOX

Electric heat for modern industry

Only **Chromalox** Radiant Heaters offer these features

•

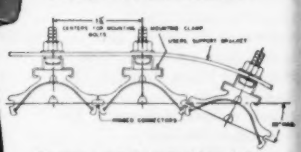
ALL-METAL DESIGN



1. Inconel-sheathed Chromalox triangular heating element.
2. Highly polished, non-oxidizing reflector.
3. Rigid, extruded metal housing.
4. Interlocking connector for assembling banks of heaters.

•

QUICK, EASY INSTALLATION



Clamps and interlocking joints simplify assembly of units into ovens, banks, tunnels, etc.

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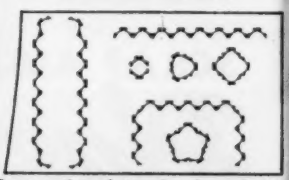
VERSATILE APPLICATION



Cross-section views of a few of the many oven designs possible with Chromalox Radiant Heaters.

For more Know-How—
Send for complete Application File

It shows you how many others are saving time, and increasing production with Chromalox Radiant Heaters.

IC-48

EDWIN L. WIEGAND CO.
7503 Thomas Boulevard
Pittsburgh 8, Pa.

Yes . . . send me the application file on Chromalox Radiant Heaters

Name_____

Company_____

Street_____

City_____ Zone____

State_____

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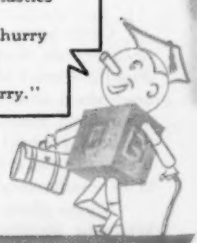
And eliminate a worry."



Quinn-Berry Corp.

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WMP "bowls" a plastic strike

Courtesy Westinghouse Electric Corporation

Once again the Worcester Moulded Plastics Company has teamed up with Westinghouse and produced a winner! This time it's a durable plastic juicer bowl which attaches to the new Westinghouse Food Mixer. Stain, shock and corrosion proof, light in weight, this bowl moulded of special acrylonitrile co-polymer is easy to clean and to keep from overflowing because of its transparency.

If your plastic problems are overflowing, call on Worcester Moulded Plastics Company. Our wide experience plus our extensive facilities can prove profitable to you whether you're planning a new product in plastics or whether, plastically speaking, you want to revamp an old one.

Customers converting to defense work are finding our background particularly helpful. Our past 5 Army and Navy E's performance, plus our knowledge of government requirements, speaks for itself.

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The Durability of BM-13080

BM-13080 is an improved impact BAKELITE Phenolic Molding Material that retains its mechanical strengths under long periods of immersion, exposure to high humidities, elevated temperatures, and mild alkali and acid solutions.

Millions upon millions of housewives, by putting their washing machines to hard service over a period of years, have provided the finest test imaginable to prove the durability of BAKELITE Phenolic BM-13080, employed for the agitators in these machines.

Such outstanding service has led naturally to other important applications. Today BM-13080 is employed for such parts as pump rotors, valves, baffle plates, gasoline pump components, soap injectors, water filters, and a great variety of equipment that calls for retention of impact strength, plus resistance to heat, moisture, and chemicals.

BM-13080 is readily molded into rich, black, smooth-surfaced products. Here are typical properties obtained by testing standard test specimens in accordance with ASTM procedures:

Molded Specific Gravity (D392-38)	**1.36-1.39**
Heat Distortion Temp. (D648-45T)	**290° F. min.**
Water Absorption (D570-42) Per Cent Gain in Weight	**0.7 max.**
Izod Impact Strength (D256-47T) Ft. lb./Inch of Notch	**0.46 min.**
Compressive Strength (D695-44T) psi	**25,000 min.**
Tensile Strength (D651-48) (⅛"), psi	**6,500 min.**
Flexural Strength (D790-45T), psi	**9,000 min.**
Modulus of Elasticity in Flexure (D790-45T), psi	**9×10^5 min.**

You, too, may have need for a superior phenolic plastic to meet exacting specifications for defense or essential civilian uses. If so, it will pay you to investigate BAKELITE Phenolic BM-13080.

For further information, present your detailed requirements to Department BY-13.

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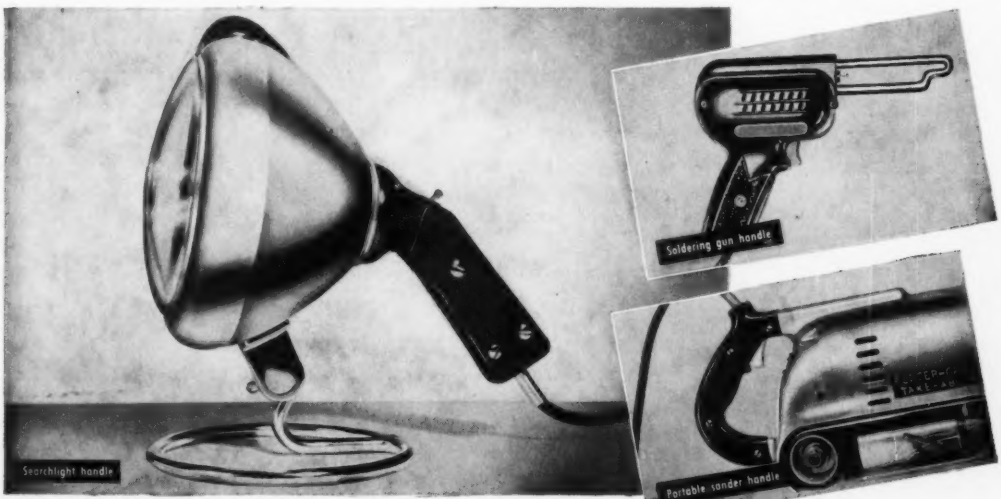
HOW G-E RUBBER-PHENOLICS CAN "HANDLE" YOUR TOUGH DEFENSE JOBS

You can get a really good "grip" on defense orders when you supply handles and other parts made of General Electric's rubber-phenolic compounds. Shock-resistant G-E rubber-phenolics make parts that can "take it." You can get the impact strength and resistance to vibration and fatigue needed for heavy-duty applications of all sorts.

Check over your jobs requiring shock resistance and see if G-E rubber-phenolics won't do the job better or at lower cost. Remember, too, that new markets open up to molders through these compounds which work successfully in applications that stump other materials. G-E rubber-phenolics have *more than five times* the shock resistance offered by ordinary phenolic compounds.

Find out how G-E rubber-phenolics can help your defense jobs by writing for experimental samples and data sheets to Section J-3, Chemical Department, General Electric Company, Pittsfield, Massachusetts.

How G-E rubber-phenolics "handle" peacetime jobs



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